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## To Our Advertisers.

William R. Wallis, for the past two years Western representative of the "American Machinist," has been promoted to the position of manager of the advertising department. Mr. Wallis will have full charge of all matters relating to this department.

## The Rock Island Arsenal Equipment Awards.

Very many of the most prominent and best known machine-tool builders are much dissatisfied with the action of the authorities of the Rock Island Arsenal respecting the proposed award of contracts for tools that were advertised for some months ago and bids for which were opened October 1 last. As has been previously noticed in these columns, the tools to be purchased by the Ordnance Department make quite a respectable order, there being over 900 machine tools, besides many small tools and special machines, and of course nearly every tool builder making tools at all adapted to small-arms manufacture has been anxious to get his share of this business—some of those bidding having, in fact, very little to show in the way of previous business with small-arms manufacturing establishments. As a result of the bidding, it is safe to say that very few indeed of the bidders would deny that some features of the case call loudly for much more reasonable and plausible explanations than have as yet been forthcoming, and in fact some of the bidders are themselves making their voices heard in unmistakable language and are declaring that they will fight the thing to the end if they have to appeal to the President or to Congress.

It is, of course, very well understood by all who know the facts that army and navy officials labor under peculiar difficulties in buying tools in accordance with the law which requires competitive bidding, based upon specifications. But notwithstanding these difficulties there has, so far as we know, never before been a case wherein the action taken was so entirely different from what a shrewd and well-informed private buyer would have taken.

So far as we can see the choice of machinery seems to have been based upon no consistent or at all uniformly adhered to principle. In one case of an old, well-known and thoroughly responsible bidder, whose bids were the lowest in over twenty items and yet were all thrown out in favor of others, we might assume, for instance, that this was because this particular firm has not been prominent and has in fact done very little in the way of equipment of the character wanted. But if we take this as an explanation, then we must expect to find the same principle applied all through the awards; whereas examination shows not only that the principle has not been adhered to, but that many facts seem to indicate that the firms having done most in the way of small-arms tool manufacturing have been least favored. In fact, the particular establishment that has been pre-eminent in this line and whose tools have won a long line of notable triumphs in the armories of the world is the very one that seems to have fared worst, having had its bids recommended for acceptance only in the case of tools peculiar to gun manufacturing and not made at all by any other builder. Thus the experience and reputation theory of the awards falls to the ground, and from such statements of the reasons for declining a given lowest bid as we have seen, no other reasonable, tenable or creditable theory is derivable. Some of the reasons given for rejecting certain lowest bids are trivial, others are such as any well-informed tool man would unhesitatingly pronounce ridiculous and absurd, and it is hard to believe that the reasons given are the real reasons that affected the decision of the man, whoever he may be, that really determined the choice.

Unsuccessful bidders, so far as we have heard from them, are entirely ready to accept defeat, but where a bid is rejected in favor of a higher one the lower bidder very naturally feels as though a reasonable, dignified and examinable reason should be given, and especially one that shall consist with actions taken and other reasons given in connection with the same affair instead of directly and absolutely contradicting such other actions and reasons.

There has been also something of what seemed like a rather high and mighty attitude toward unsuccessful bidders who have attempted to get an explanation that would really explain or to confer with the Arsenal authorities with a view to clearing up points on which there might well be chance for misunderstanding.

A private buyer of machine tools can receive quotations from those builders only whose tools he considers adapted to the work he wants to do and he need give no reasons for his final choice. It is the misfortune, perhaps, of those who manage government manufacturing establishments that they cannot pursue that course. They must accept bids from all responsible builders and must give reasons for their choice when the contract is not awarded to the lowest bidder. But many of the reasons given in this instance have been worse than none, and at this writing it seems, to judge from the temper of some of the bidders, as though better reasons will have to be presented before the curtain is rung down on this scene. We do not mean to imply, nor do any of those with whom we have talked seem to conclude that anyone connected with the affair has been guilty of deliberate wrongdoing and naturally those most interested are reluctant to talk of the matter for publication. There may be another side to the matter which we nor others have been permitted to see, but if there is then there is a loud call and one that is likely to grow louder for that other side to be exhibited.

## "Industrial Supremacy" and American Competition.

An American contributes a letter to "Engineering" in which he sorrowfully and sympathetically predicts the commercial triumph of America and the relative industrial decline of Great Britain, and seems to regard England's predicted rela-

tive decline as a very great calamity to her. This leads us to inquire if it is not just possible that too much stress is being laid upon what we call "commercial and industrial supremacy." Is it certain that because America seems likely to outstrip Great Britain in a number of lines of manufacture that Britishers really need suffer on that account? Must a manufacturer or merchant be located in the country that leads all others in volume of business in order to be happy or prosperous? The actual facts contradict any such theory. Does the fact that Switzerland is a small country—produces no iron and no coal and is relatively unimportant among the producing nations make it necessary for Swiss manufacturers to sit down and bewail their fate and imagine that there is no chance for them in the world's markets? The facts strongly contradict the existence of any such necessity. At the present time British manufacturers of machinery have their order books well filled, are making good profits and doing well. Is all this somehow turned into a calamity simply because we as a nation are gaining on them in the race for the highest numerical expression representing our manufactures of machinery and our exports of the same? Suppose the United States were to be divided in twain by a line that would leave nearly equal portions of its manufacturing in each part and that these two parts were to maintain separate governments and be called by different names. That would put Great Britain again far in the lead, would it not, as an industrial and iron producing country? But would it affect the prosperity of a single manufacturer or merchant so long as between the two new American countries absolute freedom of trade was maintained as is now maintained between the States by a provision of the Federal Constitution? The most civilized and advanced nations of the earth are yet fetish worshippers, and it seems as though there is something of fetish worship in this "commercial and industrial supremacy" business.

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Although we hear a good deal of the wonderful things that are being done or that are going to be done in connection with the Pan American Exposition at Buffalo it would seem as though not much progress is being made in those lines in which our readers are particularly interested. The representative of one of the most important machinery building concerns in the country told us the other day that his concern had been trying for months to get some definite information regarding the assignment of space at Buffalo, what it would cost, and so on, with a view to making an extended exhibit there. At this writing he has been entirely unable to get any definite information regarding the matter and does not know what he will be charged for space, nor what amount of space can be secured. In view of the fact that it is now nearing the middle of January and the Exposition is supposed to open the first of May, it would seem as though it will be quite impossible to have anything like a representative show of machinery.

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## Questions and Answers.

***Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.***

(4) A. V. M. writes: What is the correct way of spelling the plural of the word "half" (½)? I had occasion to use same on a drawing, and wrote "halves." I was told that was the old-fashioned way of spelling it; that the correct and modern way was "halfs." Is there such a word as "halfs" in the English language, outside of the possessive form? A.—The "American Machinist" does not pretend to be an authority in matters of this kind. The Century Dictionary gives the plural of "half" as "halves," but says that it was formerly also "halfs." This indicates that, according to this recognized authority, the form "halfs" is the old and obsolete one and that "halves" is the correct form for present-day use, although dictionaries do not always represent latest approved practice.

(5) R. B. H. asks: (1) Have water-tube boilers been tried or used for automobiles of the run-about style? If not, what are the reasons? If so, where can I obtain descriptions of them? A.—An adaptation of the Morin "Climax" boiler used by the New York Motor Vehicle Company, and a new water-tube boiler used by the American Bicycle Company in their "Toledo" steam carriage, are briefly described in "The Automobile," December issue, 1900. Patent 646,727, for a steam generator, issued to W. Lee Crouch, shows another style of water-tube boiler. Some miscellaneous information on this subject may be found in "The Horseless Age," Steam Boiler Number, Vol. 5, No. 10. (2) How much steam per horse-power per hour do the engines used in the "Locomobile" and similar automobiles require in actual service? A.—We have no exact information, but believe that 50 to 70 pounds for the usual simple engines would not be far wrong. (3) Has any successful attempt been made to condense the exhaust on such vehicles? If so, can you tell me where I can obtain descriptions of such condensers? A.—Not if this means using the condensed steam over again. Several vehicles heat the feed water by the exhaust, or pass the latter through the tubular frame to get rid of visible steam. (4) How much steam (in pounds per square foot of heating surface) should a small water-tube boiler fired with gasoline vapor (as in the "Locomobile" burner) produce per hour, allowing several per cent. of moisture in steam? A.—The tubular shell boilers now most used have about 40 to 45 square feet of heating surface, and will evaporate not less than 40 gallons per hour. This makes the evaporative capacity at least 8 pounds per square foot per hour, and a new boiler will do better than that.

(6) J. E. D., Muncie, Ind., sends particulars of a gas engine, and asks: (1) How to calculate the counterbalance. The engine has two cylinders with cranks in line with each other, one on each end of the shaft, a pulley flywheel being at the center of the shaft. A.—You do not say whether the cranks are on the same side of the shaft or on opposite sides. In either position they would be "in line." Considering each cylinder by itself, the counterweight for perfect horizontal balancing should be such as to produce a centrifugal force equal to that produced by a weight equal to the reciprocating parts located at the center of the crank-pin. If the cranks are on the same side of the shaft, the two weights may be added together and put in the flywheel. If, however, the cranks are on opposite sides of the shaft, the counterweight called for by one cylinder would be equal and opposite to that called for by the other, the two counterweights would then mutually destroy one another's action, and no balancing effect would be produced. The only possible way to balance such an engine is to balance each side separately by a weight in each crank disk. We assume you are aware that while the introduction of a counterbalance reduces or destroys the horizontal disturbing force, it introduces a vertical disturbing force equal to the horizontal one destroyed. (2) Is it good practice to balance the reciprocating parts by placing the counterweight in the flywheel? A.—The center of gravity of the counterweight should lie in the center line of the engine, as seen in plan. In side-crank engines, however, this is impossible, the nearest location of the weight to the correct position being in the crank disk. The amount of metal called for, however, is considerable, it is not always possible to place it all in the disk, and it may be necessary to put it, or part of it, in the flywheel. The effect, however, is not as good, because of the introduction of a slewing force which increases as the distance between crank and flywheel increases. Assume an engine having a long shaft, detached outer pillow block and flywheel located near the outer pillow block, and you will readily see that a counterweight in the wheel would have very little effect in holding the engine still, while it might, in fact, do harm by shaking the outer pillow block. In center-crank engines, if the counterweight be equally divided between the wheels the center of gravity of the weight is where it belongs, and the arrangement is unobjectionable, except for the tendency to spring the shaft which is introduced. On the other hand, as center-crank engines have two cranks there is less difficulty in finding room for the weights in the crank disks and less necessity for putting them in the flywheel.

# Commercial Review.

NEW YORK, Saturday, Jan. 5, 1901.

THE ELECTRICAL AND MISCELLANEOUS MACHINERY OUTLOOK.

The situation at the first of the year is unquestionably one of confidence. The makers of electrical machinery seem generally to be very busy at their works and there is a large amount of trade pending. One concern which devotes itself chiefly to isolated plant work for power and lighting finds things looking better than a month ago and states that it has never known more work in prospect than at present. This is largely of an industrial character. December turned out better than was expected, they say.

There is quite a little new work coming on in this city in the way of isolated plants for buildings in the business districts, but hardly any of it is in the state for estimates at present. The plant for the Broad Exchange building was ordered quite recently, the generators footing to about 500 kilowatts, to come from the Western Electric Company, and the engines from the Phœnix Iron Works. It will be a case of months, if not years, before the contracts for the new custom house are to be looked for.

The C. & C. Electric Company has booked among recent orders for direct-connected engine type generators the following: One 100-kilowatt for a factory in Pennsylvania; one 175-kilowatt for a shipyard in Chicago; one 60-kilowatt for a manufacturing company in Philadelphia; three 80-kilowatt for a manufacturing company in England; one 60-kilowatt for a cement mill in Pennsylvania, and a number for hotels and apartment houses in New York City.

According to London advices as to the proposed deal between the Cramp Ship and Engine Building Company and Vickers' Sons & Maxim, no formal amalgamation of these two concerns is contemplated, but the new company, which is to acquire the Cramp Ship and Engine Building Company and the Midvale Steel Company, will also acquire the right to manufacture in the United States and sell to any country except Great Britain and her colonies ordnance and material manufactured under the patents of Vickers' Sons & Maxim. The new company is styled the Cramp-Midvale Shipping, Steel and Vickers Ordnance Company. It is understood that $2,500,000 of new working capital is to be supplied as a result of the sale of securities. The proposed capitalization of the new concern is as follows: Common stock, $10,000,000; preferred stock, 6 per cent. cumulative, $10,000,000; first mortgage gold 4½ per cent. bonds, $10,000,000; total, $30,000,000.

The "St. Petersburg Gazette" announces that the Russian Minister of Railways and Communications has decided to equip all railroad lines in the country with express locomotives, beginning with the first of the year. The journal adds that the Russian works will be unable to furnish all the engines required.

Locomotive manufacture is at present one of the flourishing lines of industry. The output of American locomotive works (exclusive of railroad shops) for 1900, according to statistics compiled by the "Railroad Gazette," has been 3,153, which is 680 ahead of 1899, the best previous year. Of the 1900 output, 505, or 16 per cent., were built for export, which shows a falling off. In 1899, 514; in 1898, 554, and in 1897, 386 were exported. The number of cars, including street cars, built in 1900 is 124,109, against 123,893 last year in the same works. Of steel cars 14,464 were built in 1900, against 10,500 in 1899 and 2,700 in 1898.

The Schenectady Locomotive Works are experiencing an unprecedented demand and are working day and night. Among foreign work they have just finished a shipment to the Cape Colony Government and were shipping eight to Japan this week. The company put in a $350,000 power plant this year.

Steel-car building is a line destined to see a good deal of competition before long. Besides what we have already published on this subject, it may be mentioned that the Cambria Steel Company, Johnstown, Pa., is to adapt its new works to that purpose and has already taken an order for 500 cars for the Philadelphia & Reading Railroad. These are included among orders by the railroad for more than 2,000, of which 1,000 have been contracted for with the Pressed Steel Car Company. It is understood that the Southern Car and Foundry Company has made an arrangement with the Tennessee Coal, Iron and Railroad Company by it will establish a plant for the manufacture of steel cars in the Birmingham (Ala.) region.

The net earnings of the American Car and Foundry Company for the nine months ending November 30, 1900, were $4,196,224.21.

A new engine-building company is on the road to establishment in Milwaukee, Wis. It will be called the Brown Corliss Engine Company, and will have a capital stock of $1,000,000. T. W. Phillips, of Providence, R. I., will be president and sales manager; Walter F. Brown, of Milwaukee, vice-president and superintendent of the plant, and Charles Rohde, of the same place, treasurer and business manager. Messrs. Phillips and Brown have been with the Filer & Stowell Company, of Milwaukee. The company is to turn out an established type of engine and will build a plant for the purpose.

The E. P. Allis Company, Milwaukee, Wis., has agreed upon certain conditions to erect its new shops in the township of Wauwatosa. The company will not abandon its plants on Clinton street, Milwaukee, or at Bay View, but the lease of the Buffalo plant expires in about a year. The new works are expected to be ready in eight months.

McEwen Brothers, of Wellsville, N. Y., have been incorporated to manufacture steam engines and boilers, with a capitalization of $140,000. The directors are: D. S. McEwen, H. W. Breckenridge, of Wellsville, and James H. McEwen, of New York City.

The finer grade of files made by the Nicholson File Company, Providence, R. I., which they designate "X. F." and which are for watchmakers' and toolmakers' uses, etc., are less advertised than some of the other grades since the competition of cheap foreign makes renders the profits upon them small. In spite of this, the company not only supplies a large number of leading jewelers and manufacturing concerns in this country which require such files, but is shipping them abroad in good-sized lots. The company states that these files have already supplanted to a very fair extent the Swiss and French files made for the same class of work and are steadily gaining ground from foreign competitors. Some of these files are so small that it would take 200 dozen to weight a pound and the cut is only visible with a magnifying glass.

The Cleveland (O.) Punch and Shear Works Company has nearly completed a new erecting shop and soon expects to be in shape to make better deliveries. The new shop will have a complete electrical equipment, including electric traveling crane, and will be a modern one in every respect. From a list of recent shipments reported we select the following for mention: A 25-ft. plate planer to the National Tube Company, McKeesport, Pa.; a 44-inch throat punch on the order of the Pratt & Whitney Company, of New York; a 30-inch throat punch, a 10-inch throat punch and a 12-foot radial drill to the Browning Engineering Company, of Colinwood, Ohio; one 50-inch rotary planer with 12-foot bed, and a 15-foot radial drill to the Hay Foundry and Iron Works, Newark, N. J.

One of the news items at the end of the year was the decision of the Carnegie Steel Company to maintain the same wage rates for its 30,000 or more employees in 1901 as in 1900. September 30 the company gave the requisite three months' notice of a desire to change the schedule, and it was thought that a reduction would be made. There was some business uncertainty at that time, but now prospects are so favorable in the opinion of the company as to justify a maintenance.

CINCINNATI REPORT.

The resumption of manufacturing activity after holiday frivolity has been of a very gratifying character in this market. Those concerns which closed down either for stock taking or improvements have, for the most part, resumed, beginning promptly on January 2. There is a distinct brightening of the horizon in the machine-tool line.

The principal event in the buying market of the week was probably the visit of R. W. Mattox and H. M. Wells, of Little Rock, Ark. The gentlemen were here to purchase the equipment for an entire new plant, the Little Rock Ginning and Machinery Company. They purchased practically their entire equipment in Cincinnati and divided their favors among the American Tool Works Company, the Bickford Drill and Tool Company, the Cincinnati Milling Machine Company, the Cincinnati Planer Company and the E. A. Kinsey Company. Orders were placed for shipment in about sixty days. It is understood that the new company will, besides devoting themselves to the manufacture of cotton-ginning machinery, handle extensively planers, drills, etc., for the Western market.

The larger concerns report orders coming in from dealers in very good volume, suggesting a feeling that the bottom has been reached in prices and that now is the good time for stocking up. There is little foreign business that for which one explanation adduced is that nearly all the big concerns had representatives in Europe during the fair and they supplied every dealer of importance on that side during their visit.

The Bickford Drill and Tool Company reports some inquiry from abroad. One good-sized order received the last day of the old year was for a radial drill from Brussels. This company considers prospects exceedingly good.

The E. A. Kinsey Company, one of the largest jobbing houses in this section, reports December the best month in the recent history of their business and says that inquiry and activity has spanned over the holidays in a most gratifying manner.

There is no agitation apparent in labor circles, and none expected earlier than next May. The G. A. Gray Company created a little stir in an arrangement which has been denominated a Christmas gift to their employees, with the announcement that on January 1 working hours would be reduced from 60 to 57 hours per week with full pay. This concession, however, will have no effect on the attitude of either parties to the contemplated change which is due May 18 next. The Gray Company does not belong to the National Metal Trades Association, nor are their employees, any of them, identified with the International Association of Machinists. It is explained that this was entirely a personal matter, and is not expected to influence any other concerns.

The Cincinnati Milling Machine Company, in summing up the year's record, finds the last three months to have been especially favorable.

The situation in electrical-power manufacturing circles suggests a generally optimistic feeling among all larger manufacturers. The Triumph Electric Company among other work has just installed a complete lighting and power plant for the Eureka Foundry Company, Cincinnati. The Carlisle & Finch Company, manufacturer of electrical and scientific novelties, reports a number of important searchlight contracts from the United States Navy and Army.

The feeling on the whole is that 1901 promises to be a banner year in machine-tool making lines.

CHICAGO MACHINERY MARKET.

There are no exceptions to the reports in the West that the electrical machinery trade is satisfactory—not active, but satisfactory. From the middle of December to the middle of January little is expected by way of new business, but more than a little has been realized. Much inchoate trade still hovers in the misty future awaiting developments. The inquiry that is in the market is largely that which has been carried over from a month or two ago, or even longer, but affairs are said to be gradually shaping themselves for heavy transactions.

Cement plants continue persistent seekers of electrical-power installations. Within a few days, it is stated, the Detroit Portland Cement Company, which contemplates the erection of a large plant at Fenton, Mich., will purchase motors and generators of about 1,000 horse-power each. The Alsens American Portland Cement Company, of West Camp, N. Y., will also install an electrical-power plant of about 1,500 horse-power in generators and motors.

The Toledo Bridge Company, which some weeks ago bought a large generator from the General Electric Company, has purchased thirty-eight motors, aggregating 600 horse-power, from the Crocker-Wheeler Company. The Crocker-Wheeler Company has also sold to the Armour Company, of Chicago, a 150 horse-power motor-generator for insulating a trolley line from the main circuit, also a 100 horse-power motor and 135 horse-power in other motors to the Anglo-American Provision Company and 250 horse-power in motors to the American Car and Foundry Company, of St. Louis.

The Sprague Electric Company has sold two 100-kilowatt generators to the American Car and Foundry Company, of St. Louis, to operate machinery. They have also received from the Geuder & Paeschke Manufacturing Company, of Milwaukee, an order for 100 horse-power in generators and motors, supplementary to the electrical equipment previously installed.

Jose R. Crespo, manager of the newspaper, "El Diario," Buenos Ayres, Argentina, has just completed a visit to Chicago, where he bought a large newspaper press and outfit, including thirty motors, the entire plant equipment costing $50,000.

The C. & C. Electric Company has done a large business at Chicago during the past month. The Northern Electrical Manufacturing Company is crowded with orders. Kohler Bros. have booked many orders and the sentiment of the trade generally is optimistic.

A large dealer in machinists' supplies says trade has been best in those lines that have been least affected by the upward trend in prices. For chucks, which are slightly lower than a year ago, demand has been good, and calls for emery wheels, which are no higher than two years ago, keep up remarkably well. But for files, he says, there is noticeable reduction in demand. Many old files are being recut. Some machinists even go to the scrap heap and unearth a few old bolts rather than buy new ones, under the impulse that combats an advance.

The successors to the Marshall & Huschart Machinery Company will be the Marshall-Doan-Ransom Company, who will begin business under that corporate name early in January. Mr. Doan is late of the firm J. B. Doan & Co. and Mr. Ransom has been with Mr. Marshall for many years. The capital stock is increased from $50,000 to $100,000 and the commodious salesrooms of the old company at 62 and 64 South Canal street will be occupied. In addition to former machine-tool lines handled, the new company will add others that do not conflict. A large stock of tools will hereafter be carried at Cleveland, Ohio, the company heretofore having only an office in that city.

## Quotations.

NEW YORK, Monday, Jan. 7.

Iron—American Pig, tidewater delivery:—

| | |
|---|---|
| Pennsylvania Irons: | |
| No. 1 X foundry | $16 50 @ $17 00 |
| No. 2 X foundry | 15 75 @ 16 00 |
| No. 2 plain | 14 75 @ 15 25 |
| Gray forge | 14 50 @ 15 00 |
| Alabama Irons: | |
| No. 1 foundry, or soft | 15 25 @ 15 75 |
| No. 2 foundry, or soft | 14 50 @ 15 00 |
| No. 3 foundry | 13 75 @ 14 25 |
| Foundry forge, or No. 4 | 13 25 @ 13 75 |

Bar Iron—Base sizes—Good standard brands from store, 1.75 @ 1.90c.; mill prices on dock, 1.50c. upward.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—From store, 1.70 @ 1.80c.

Cold Rolled Steel Shafting—Base sizes—From store, 2.50 @ 2.75c. The shafting manufacturers have agreed upon an advance at mill, which is affecting store prices somewhat irregularly.

Copper—Lake Superior ingot, in carloads, 16⅞ @ 17c.; electrolytic and casting, 16½ @ 16⅝c.

Pig Tin—27 @ 27¾c., for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½c. extra for carloads.

Spelter—4½ @ 4.17½c., New York.

Antimony—Hallett's is now quoted as low as 9c. and Hungarian a trifle less.

## The Paris Exposition—XVII.

A SWEDISH LATHE.

The tools shown at Paris by the Aktiebolaget Verktygsmaskiner, of Stockholm, Sweden, clearly show the influence of American machine-tool practice. They are not exact copies of American tools, but have been modified or changed to suit the ideas of their Swedish designer or the market to which they chiefly go, and something of interest will be found in them. The shops of this company, at Stockholm, from which these tools come, show the most advanced ideas, both in construction and equipment, a large proportion of the tools in use having been made in America.

At Fig. 147 is shown what they call their "rapid semi-automatic lathe," which, in general, looks quite as though it might have been the product of an American shop; and, as showing that its builders appreciate what is often required of a modern lathe, it is interesting to note that they put special stress upon the facts that, with this lathe, "a mere motion of the hand gives, instantaneously, every spindle speed, every thread and every feed, while the lathe is in motion"; that "there is not a single loose gear about the machine"; that "the patent belt-shifter and the friction head permit the speed of the machine to be changed from any one of the eight speeds to any other one without stopping," and that "if the countershaft is ordered for two belts, there are sixteen changes of speed available without stopping the lathe." The photograph and the drawings, Figs. 148-9, show the construction sufficiently well to make an extended description unnecessary. It will be seen that the Norton device is used for feed changes and for screw-cutting gears and that the automatic stop for the lead screw and feed rod is also employed. The lead-screw is inside the bed and is "at a stillstand" when not screw-cutting. Nine changes of feed are provided for by the gears within the bed, arranged in series, and by moving the index handle in the horizontal slot seen in the side of the bed below the headstock. four additional series are obtained by varying the speed of the shaft on which the cone gears are placed; thus giving a total of thirty-six threads and rates of feed, besides which there is a two-step cone for the latter, and the gear bracket at the end of the headstock can be removed and other gears substituted—as, for instance, to cut metric threads.

Though the lathe is shown with the form of tool rest and clamp generally approved in Europe, it is made also with the American form of post of the Bauer pattern, and with a threaded collar by which the tool can be adjusted vertically. All traversing screws have micrometers, and there is a Slate taper attachment in addition to the compound rest.

A VERTICAL TURRET MACHINE.

For some reason which I do not quite understand, vertical turrets are more favored in Europe than here, and at Figs. 150-1 is shown a machine which may be taken as typical of a line of similar machines built by this firm, and several examples of which besides this one were shown at Paris. The turret is mounted on a cross-slide, so that when this is brought forward, the turret can pass by the work with the tools overhanging the latter, or the work may pass through the turret tools and turret, as is common with our machines; and when used as first mentioned, a holder with square head, slot and set-

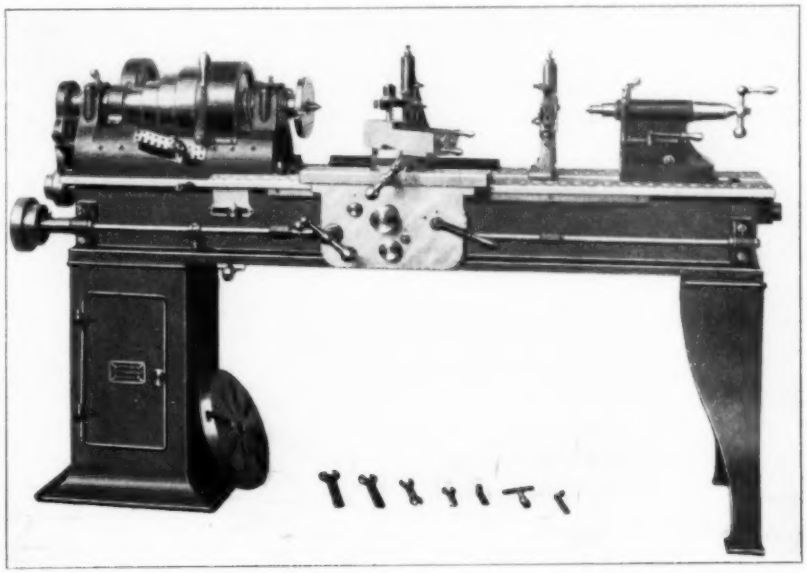

FIG. 147. A SWEDISH LATHE SHOWN AT PARIS.

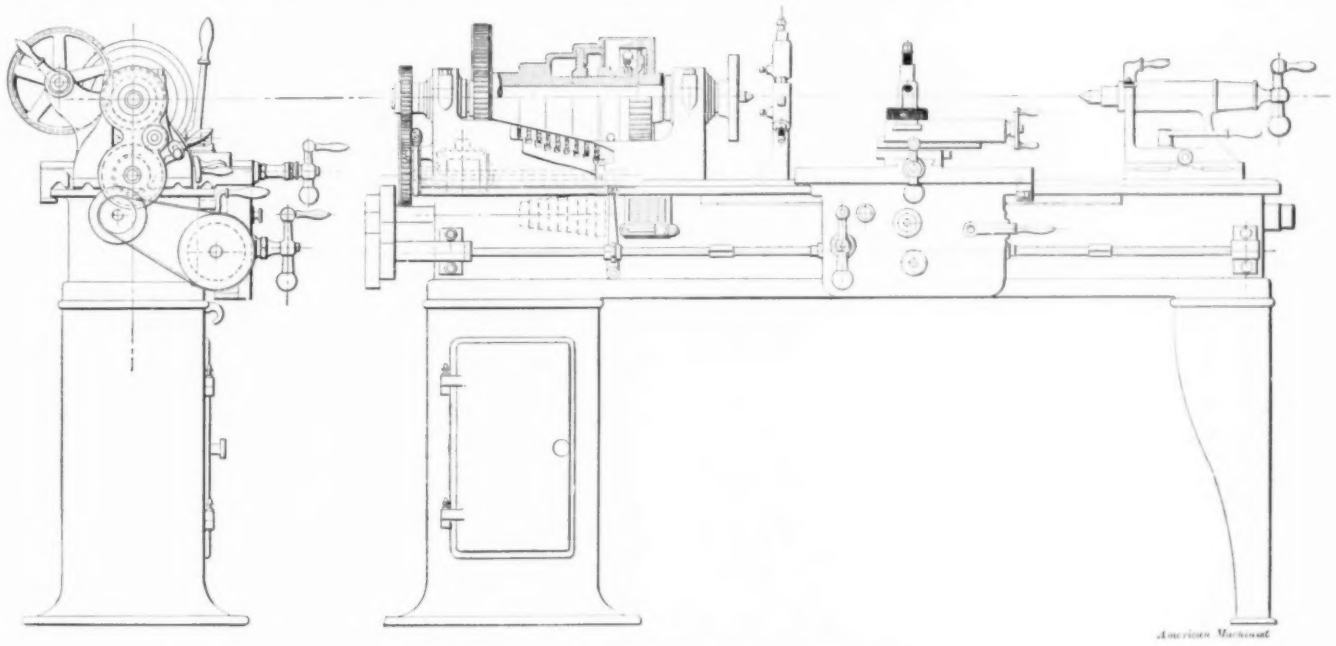

FIG. 148. END VIEW AND ELEVATION OF SWEDISH LATHE.

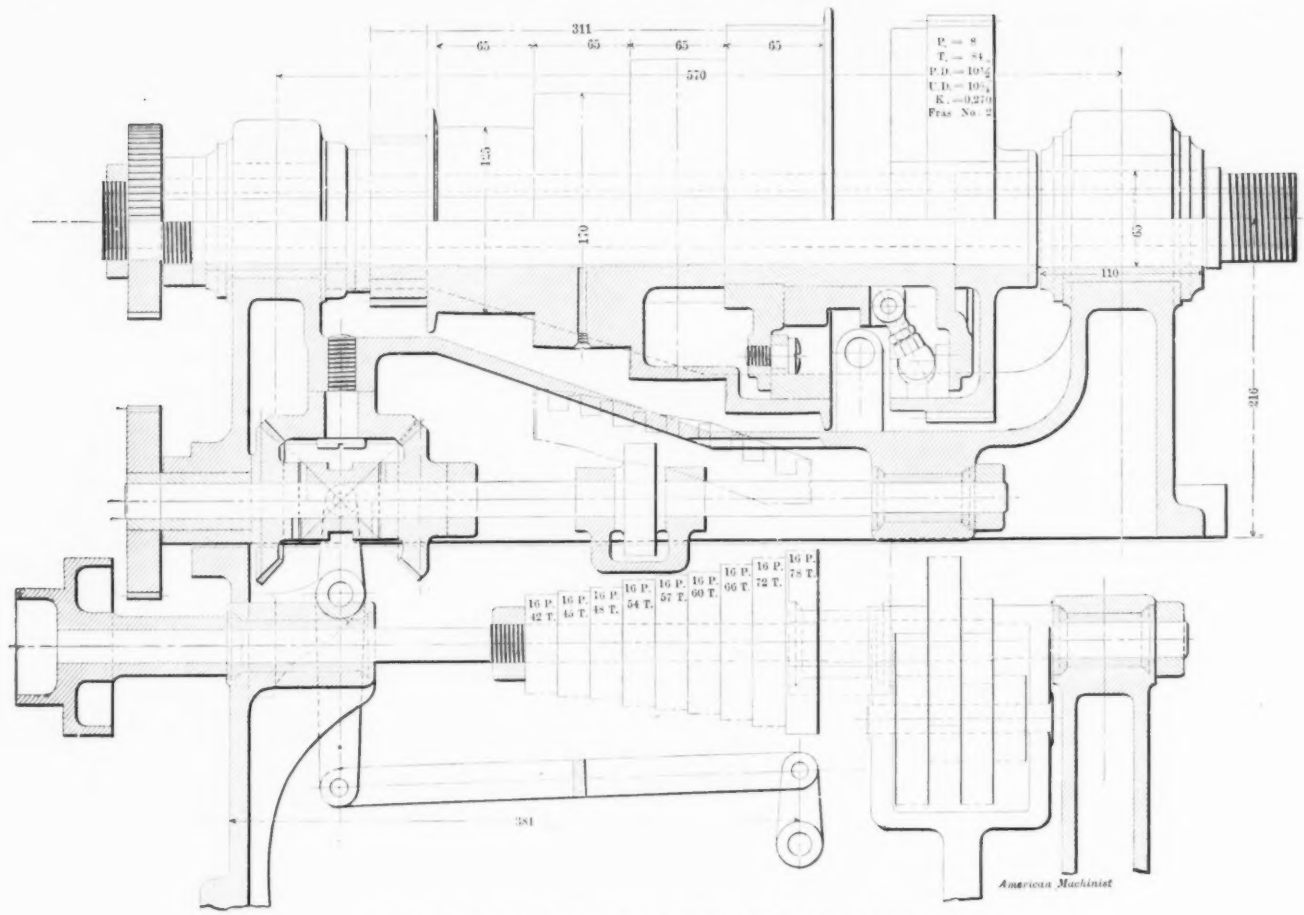


FIG. 149. SECTION THROUGH HEADSTOCK OF SWEDISH LATHE.

screws is used to hold plain forged tools cutting without back rests. Special stress is laid upon the small cost of tools needed to do work—a point which is, in European practice, I think, too often allowed to obscure much more important considerations. This machine rotates its turret automatically, and the turret is locked in position by a pin which engages it very near the periphery. There is a Parkhurst rod-feed with a vertcial instead of a horizontal lever to operate it; a chasing bar with the lever by which it is handled passing under the bed and up to the bar at the rear, and the slide on which the lever rests at the front of the bed has an inclined plane at the end, by which the chaser is automatically thrown out, always at the same place. The Conradson device for an independently adjustable stop for each tool in the turret is used, and the tool is made with or without the friction head—being shown without it in the photograph and with it in the drawing. There are independently adjustable stops for each tool when the turret is moved across the bed, and there is also a stop which centers the working tool of the t rret when it is to be used that way. The lever behind the turret-slide handwheel is loose upon the shaft and has a pin which can engage with any one of a series of holes drilled around the inside of the hand-wheel rim, so that the turret can be thus fed when desired for facing cuts,

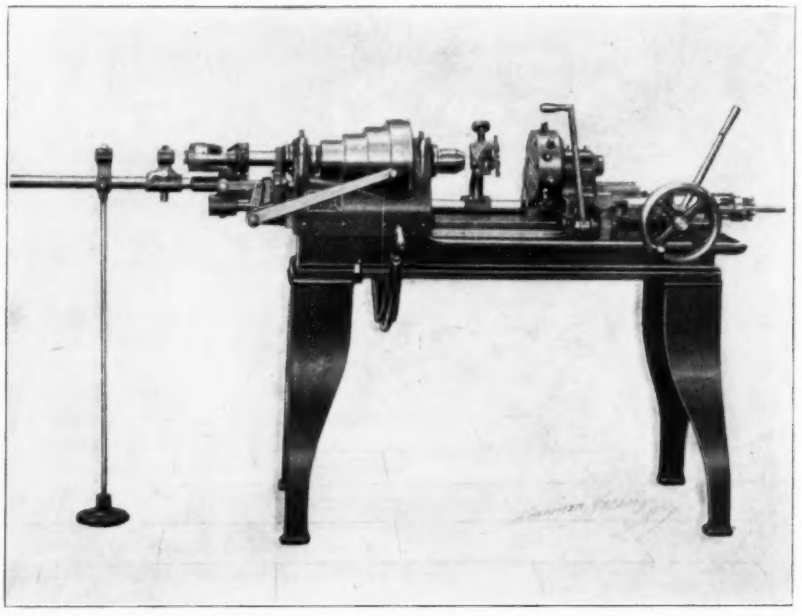

FIG. 150. SWEDISH VERTICAL-TURRET MACHINE SHOWN AT PARIS.

etc. At the back of the bed is a taper and copy-turning attachment, by which tapers and forms of irregular outline can be turned and the makers make a special virtue of the fact that this does away with expensive forming tools such as are ordinarily used on American machines of this character. But here naturally arises the question which has been previously referred to, and the answer to which must be based upon the relative cost of the template or former, which has to be provided in any event for the Swedish machine, compared with the cost of the forming tool and the difference in the quantity of work that can be turned out by the two methods. Of course the template costs somewhat less than the forming tool, and

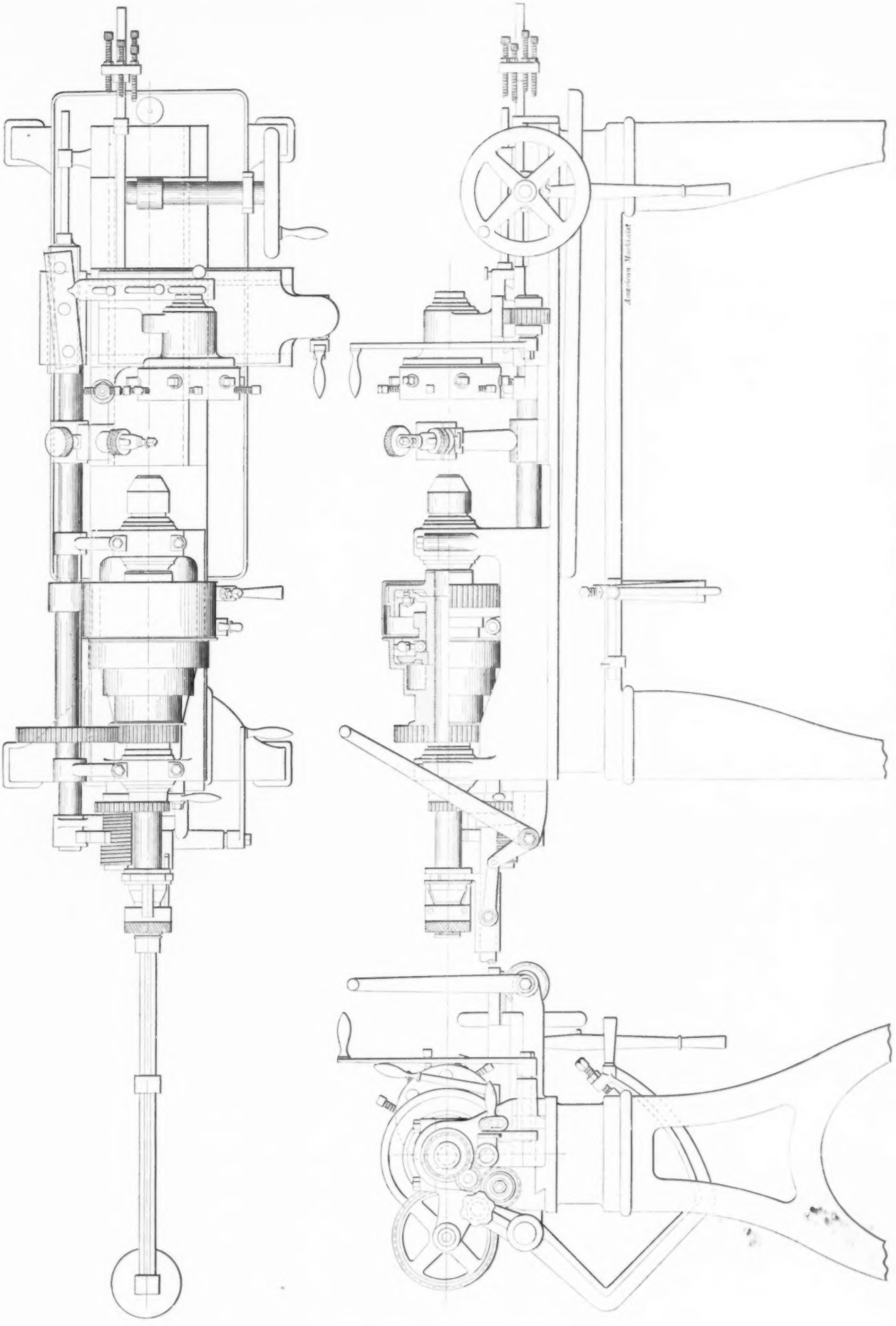

FIG. 151 SWEDISH TURRET MACHINE SHOWN AT PARIS.

for that reason it probably appeals to those who do not seem much inclined to look further than the first cost of a tool; but would, I think, meet with less favor here, where, usually, the rate-of-production view of the matter takes precedence of the consideration of first cost of tools.

A SPECIAL LATHE FOR BUFFER HEADS.

Quite a line of machines similar in general design to those shown were exhibited by this firm, but I pass on to a machine shown in Figs. 152-3-4, which is built to do a job which we do not do at all here—first, because we do not use the form of buffer used on European railway cars, and, second, because if we were to use such a buffer (four of them are used on every European car), we would almost certainly not turn them all over as this machine is made to do, if indeed we should do any lathe work upon them at all.

The machine is seen to be a double lathe, and in Fig. 152 the shank of a buffer is being turned in one end of it, while in the other the buffer head is being turned to shape on both its front and rear surfaces simultaneously. Both carriages have two cross-slides and tool-rests. In turning the shanks of the buffers, this enables the two tools to be used independently of each other and for facing and shaping the heads formers are placed inside the cross-slides, as shown at Fig. 154; these formers giving the head the required shape, as the tool is automatically fed outward or inward. At Fig. 153 the same lathe is shown with the attachment in use by which the buffer case is bored and the ends of the four legs on which it stands are at the same time faced off true. There is an automatic feed by means of a ratchet wheel applied to the footstock spindle for this job, and the chuck used is of course of special form. Although intended primarily for this particular job, the lathe is adapted to other work of similar character, and it is built in three different patterns—*i. e.*, double buffer head machine, double buffer shank machine and as shown, for both operations in the one machine.

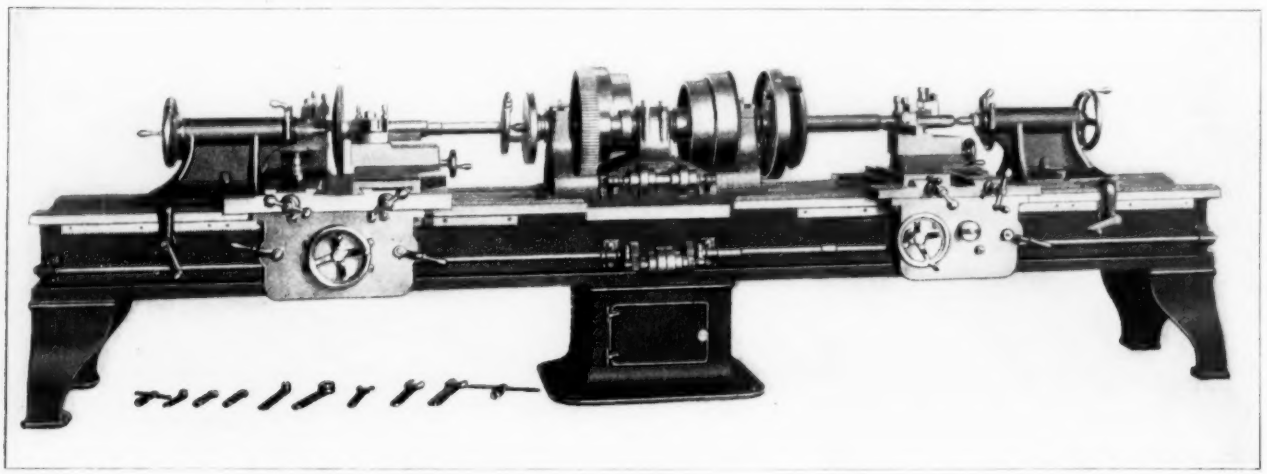

FIG. 152. SWEDISH LATHE FOR FINISHING CAR BUFFERS, SHOWN AT PARIS.

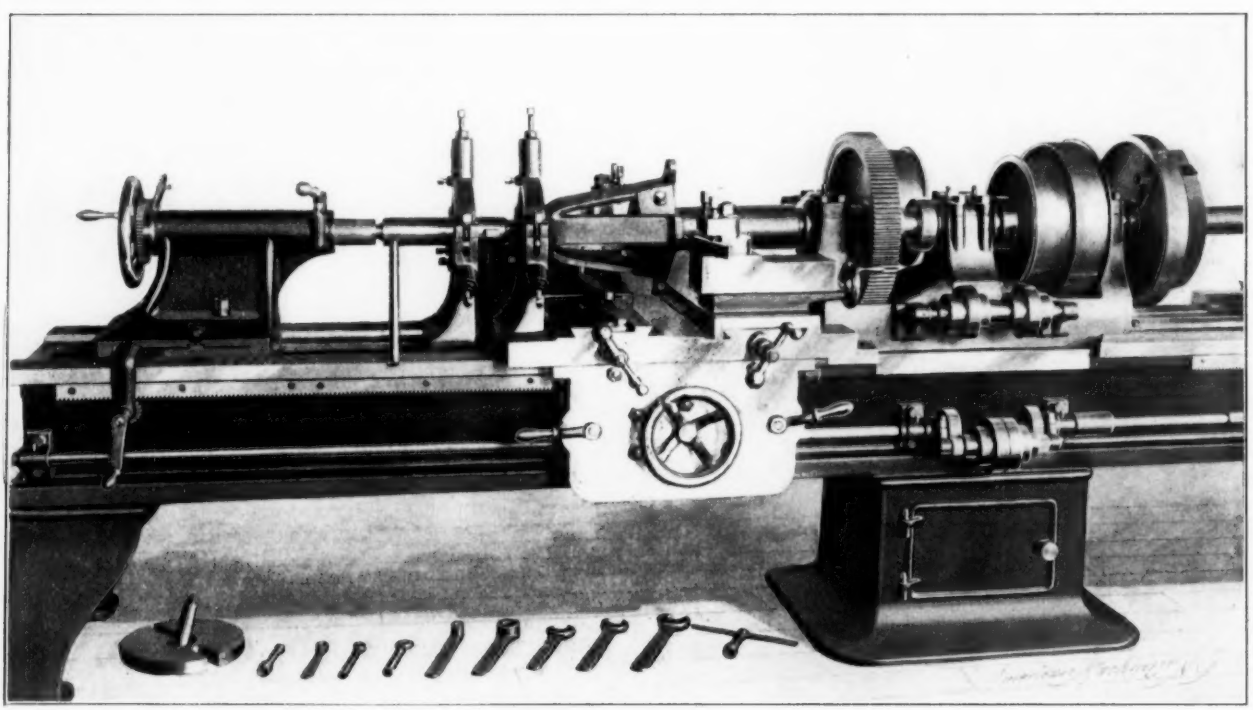

FIG. 153. SWEDISH LATHE FOR CAR BUFFERS, FITTED UP FOR BORING AND FACING BUFFER CASES.

SOME COINING MACHINERY.

I have previously mentioned some of the coining presses that were shown at Paris and the beautiful work that was turned out on some of them. For thoroughly up-to-date and efficient coining ma-

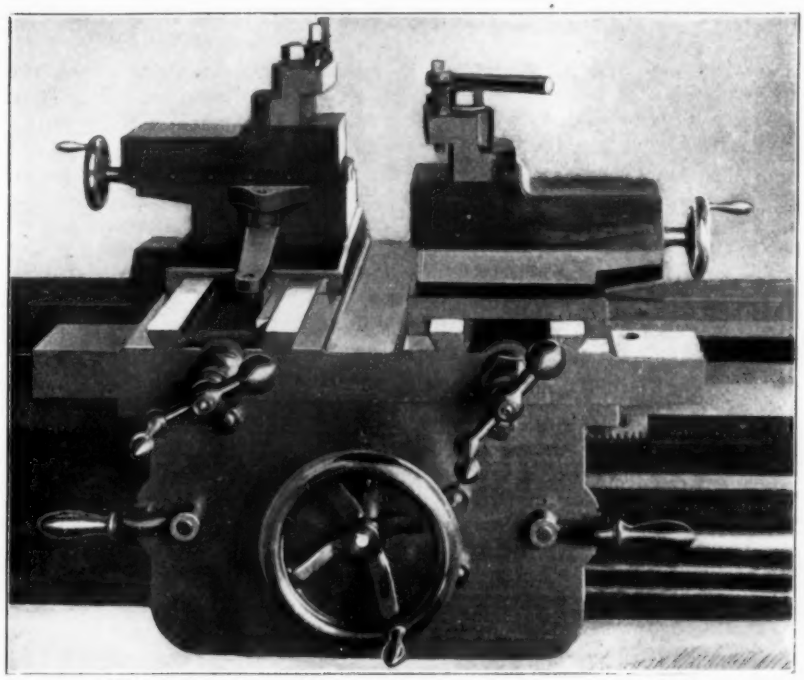

FIG. 154. ENLARGED VIEW OF CARRIAGE OF SWEDISH LATHE, SHOWING FORMERS FOR SHAPING BUFFER HEADS.

chinery, however, I think the palm is undoubtedly to be awarded to an American firm—the Ferracute Machine Company, of Bridgeton, N. J., who for some time past have been making coining machinery for foreign governments, who have appointed commissions to investigate and select the most advanced machinery for the purpose. A line of this machinery was shown at Paris, and two of the machines shown there are represented by Figs. 155-6. The first mentioned machine is for cutting out the blanks (or planchettes) from the strip of metal, which is fed to the dies by the feed rollers seen in front of the machine, but turned down out of their working position in order to show the facility with which this can be done, when for any reason it is desirable or necessary to do it for access to the dies, and leaving the bed entirely clear when dies are to be set or changed. There is a set of feed rolls on each side of the machine, and they are mounted in frames which are hinged to the frame of the machine, so that by the loosening of two nuts the roll frames are released, and when restored to their working positions the gears that drive the rolls take care of themselves, so far as proper engagement is concerned. The well-known principle of multiple pawls is made use of to obtain a finely graduated feed, there being, in this case, six pawls engaged with one ratchet wheel, so that a feed of one-sixth of a ratchet wheel tooth space can be obtained if necessary. To an American at least, and I think to most others as well, who have given any attention to machine design, the appearance of this machine is very pleasing as compared with others for the same or similar work exhibited at Paris. The machine shown weighs about 4,100 pounds, exclusive of the motor and its attachments; has a flywheel weighing about 1,500 pounds; runs at about ninety strokes per minute, and can exert a pressure of about 52 tons upon the ram. This particular machine is of course adapted to general work as well as coining.

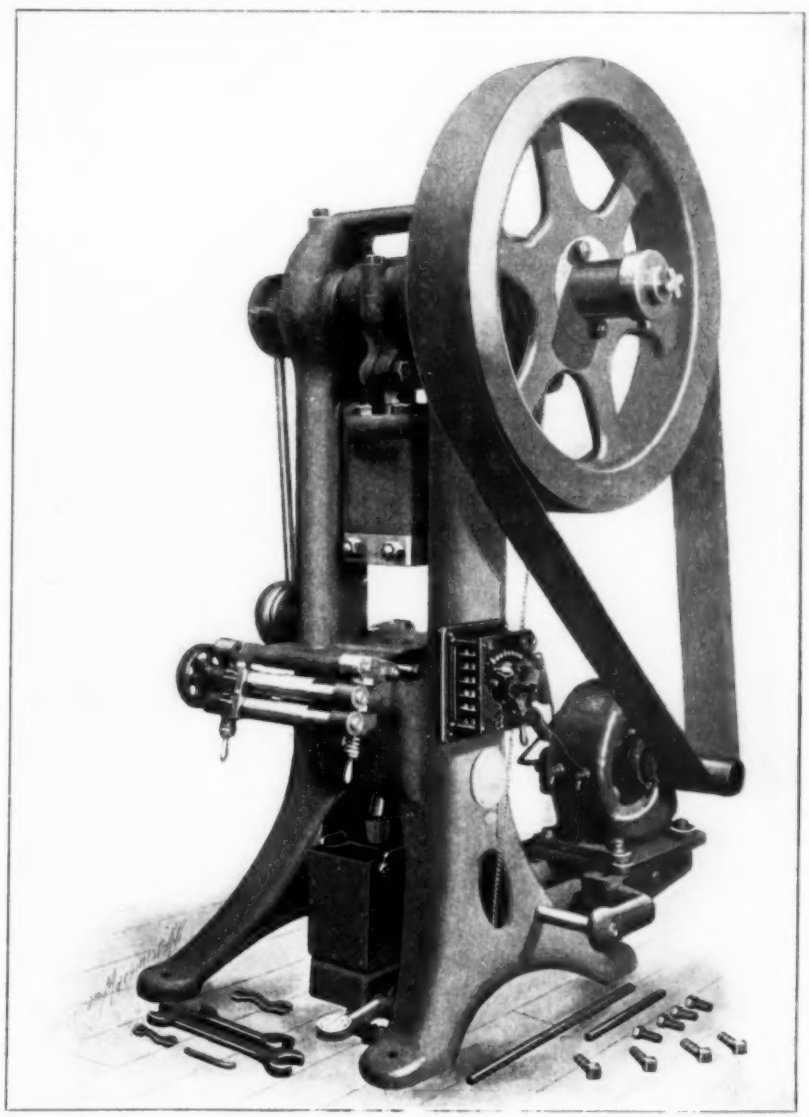

FIG. 155. PRESS WITH DOUBLE FEED ROLLS AND ADAPTED TO CUTTING BLANKS FOR COINS, SHOWN AT PARIS BY THE FERRACUTE MACHINE COMPANY.

### COINING PRESS.

The coining press is shown at Fig. 156, and this is of course the principal machine used in making coins. It is entirely different from any machine for the purpose that has preceded it. The frame is in one solid piece from the floor to the top, and of such form as to give the utmost possible rigidity. The very great pressure required is obtained by means of a toggle-joint arrangement placed near the base of the machine, and the upper die is stationary, all the movement being by the lower die. This arrangement has several important advantages, among which are that, owing to the fact that all the working parts of the machine that require lubrication are below the lower die and below where the coins are handled, there is no danger of getting oil on to the coins, and the machine is more stable and subject to

less vibration than can very well be the case where heavy and rapidly moving parts are near the top. Then, too, gravity keeps all the parts close together at all times, so that there is absolutely no lost motion to be taken up when the dies come together, and this is much better for the dies, conduces to better work and makes the machine run much more quietly than would otherwise be practicable. Another novel feature of the press is in the fact that the upper die is held in a block which is hinged

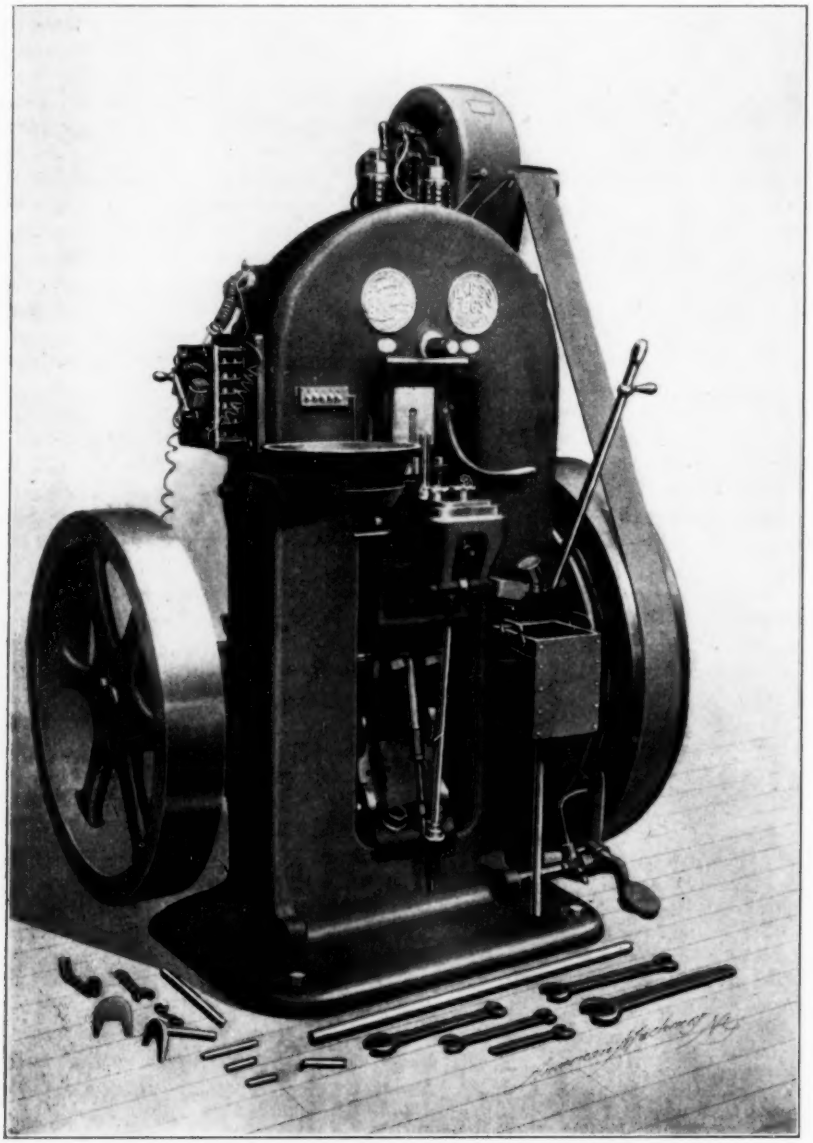

FIG. 156. AUTOMATIC COINING PRESS SHOWN AT PARIS BY THE FERRACUTE MACHINE COMPANY.

in the upper part of the frame; so that by taking hold of the lever provided for the purpose, the die can be swung outward toward the operator for inspection, and when returned to its place is firmly locked there. Those who have had to do with or have seen much of coining operations, know the importance of this last-named arrangement; it not only gives a much better chance to inspect and clean the dies from time to time as required, but it enables the vertical movement of the lower die to be reduced to that amount only which is actually needed to insert and remove the coin from between the dies, and for this reason the movement of the die in this machine is only about ⅛ inch, which amount is better than the customary 2 inches or more, for several reasons, among which are that the coin is better confined in the dies, so that it cannot jump out of place; the machine runs more quietly and can be operated at a higher speed. The feed mechanism is also an improvement over the older forms, and is so arranged that the coins are moved each time only a little more than their diameter. The press shown is capable of coining pieces up to and including 1⅛ inches (half dollars), weighs about 5,200 pounds, and is capable of exerting a pressure upon its ram of 150 tons.

AN ARMATURE DISK NOTCHING MACHINE.

An armature disk notching machine exhibited by the same firm presents some points of interest, and is shown at Fig. 157. The more prominent features of the machine are made plain by the photograph. The indexing mechanism is operated from the crank-shaft through the medium of the bell crank shown at the side, and the connection from this crank to the pawl lever is by means of a telescopic pitman made of bicycle tubing, so that it can be adjusted to the different positions of the saddle (carrying vertical indexing spindle) required by the varying sizes of disks. On the lower end of the indexing spindle is placed a very large spur wheel, into which engages the pinion that is on the same shaft with the ratchet disks. Various disks are supplied, and they can be very quickly changed when required, although a given disk will give a considerable range of indexing by varying the number of notches taken at each stroke. On the large spur gear is a tappet which, when the wheel has made one revolution, throws out the clutch and stops the machine, and when the wheel has been moved for a notch, a brake, operated by the same connection to the crank-shaft, prevents the wheel from going beyond its proper position, or over-running, when moving fast, and holds it still while the punch is descending; this brake enabling the machine to be operated at a higher rate of speed than would be possible without it—up to 200 strokes on the smaller disks. The die bed is adjustable vertically, so that the die can always be set at the right hight, and the depth of the notches can be accurately secured by means of the screw movement of the saddle upon the bed.

A DIAL-FEED PRESS.

At Fig. 158 is shown a standard press, such as is built by the Ferracute Company for a variety of purposes, but with an interesting dial-feed arrangement. The other and older forms of dial feeds are provided for the machine when they are desired, but the one shown is notable for its extreme simplicity and positive action.

On the outer end of the crank-shaft is what may be termed a drunken worm—*i. e.*, a worm in which the threads have the regular pitch, such as all well-regulated worm-threads are supposed to have, for about halfway around the worm, but for the other half the threads do not advance at all, but are in planes that are normal to the axis of the worm, so that the movement of the vertical shaft and disk is confined to one-half of the rotation of the crank-shaft, and has therefore the same intermittent motion that it would have were it driven by a ratchet and pawl. The dial itself can be accurately adjusted around the vertical shaft by means of the set-screws seen on the collar just above it, and the die can be adjusted in the bolster radially, so that any relative position can be readily obtained, and therefore great accuracy in alinement can be secured either in cases where the dial is made thick to carry a set of dies with it or where

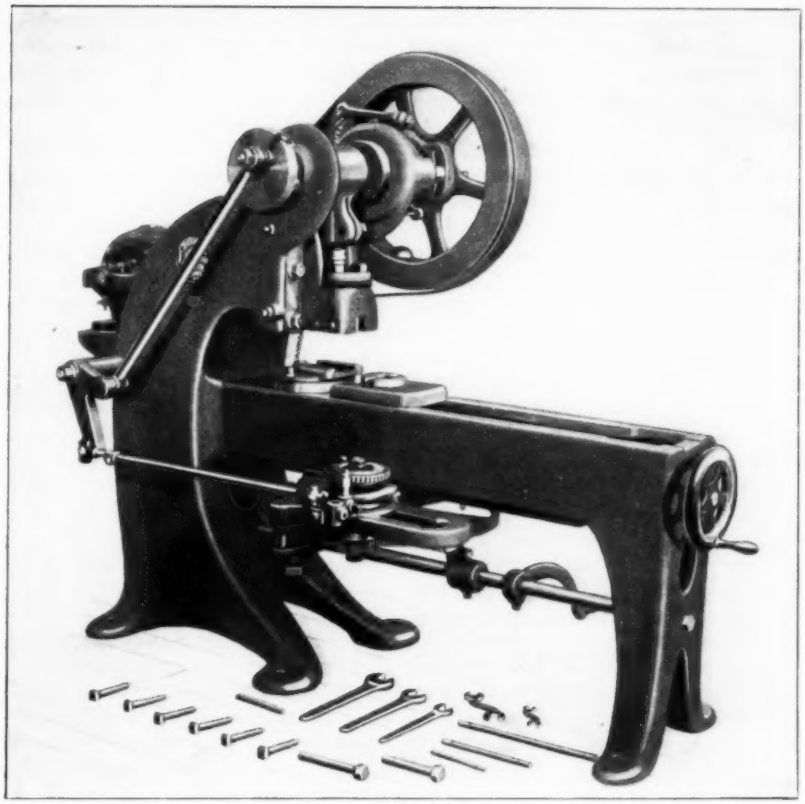

FIG. 157. ARMATURE DISK NOTCHING PRESS SHOWN AT PARIS BY THE FERRACUTE MACHINE COMPANY.

it is made thinner to carry the work to a stationary die beneath. Attached to the ram is a hardened steel pintle which enters countersinks in the dial, and which is adjustable in all directions, laterally as well as vertically, so that great accuracy of dial position can be secured when it is important. F. J. M.

## The Tool Builder and his Customers.

A little machine-shop comedy which an "American Machinist" man happened to witness the other day and which had a happy ending has its element of instruction in it also.

The builder of a lately developed machine for doing lathe work has for a neighbor a shop in which they do a variety of work and among other things make certain rings of cast iron of a somewhat peculiar shape. They make a good many of these rings and had been running six or eight lathes on them, each lathe making about ten rings per day.

The tool builder saw the work going on and offered to make such rings in his own shop at a price equal to about half what they were costing as made on the lathes. Soon after he got the job going in his own shop, the man for whom he was doing the work came over to see how it was getting along. He saw these rings being turned out at the rate of about ten per hour and he waxed wroth. "Why," he said, "you are making about 17 cents a piece clear on these rings." "Yes," the tool builder said. "Why, that is highway robbery, and there is nothing fair about it." "Well," said the tool builder, "how do you make that out? I am making these rings at considerably less price than what they have been costing you, am I not?" "Yes, you are; but at the same time it seems to me you have no right to make such a profit out of me. I cannot make any such profit as that on my work and I don't see why you should demand it." Said the tool builder: "I have not demanded anything of you. I simply offered to make these rings for considerably less money than you were able to make them yourself. I am living strictly up to the contract and fail to see where you have any grievance against me." The rest of the conversation was inaudible until at the final end our man heard the tool builder say, "Well, Mr. B——, shall I send the machine over to-day or will to-morrow do?" "Well, said he, "the sooner you send it the better," and the machine arrived in Mr. B——'s shop the next day.

FIG. 158. PRESS WITH DIAL FEED SHOWN AT PARIS BY THE FERRACUTE MACHINE COMPANY.

## Interchangeability in Marine Work.

At the recent annual meeting, in this city, of the Society of Naval Architects and Marine Engineers, one of the most suggestive of the papers presented was that by W. D. Forbes, upon "The Interchangeability of Units for Marine Work." The author spoke of the work which the United States has done in promoting, if not indeed in originating, the use of interchangeable parts in machine construction and in engine work, and urged the enlargement or extension of the system to embrace complete units, instead of the minor parts as now practiced. The plan proposed by the author was not necessarily to adopt any special design for any particular place, but to have the various designers and builders make their product to fit in the same places. For instance, generating sets of the same kilowatt capacity, no matter by whom built, could have base-plates of the same shape and size with the holding down bolts in the same position, and so on. The same principle would be applicable to pumps and to the various types of auxiliary engines employed in marine service. The trouble at present is that no standards exist for any of these things, and no builders have made any attempts to conform to the shapes or dimensions of others. The interchangeability of entire units, as advocated by the author, seems to have received more attention abroad than with us. In some parts of the world, it is stated, interchangeability of entire units is recognized as not only possible, but is actually carried out. Small marine engines are so arranged that instead of making repairs in place, one of them is quickly lifted out of the hull and another engine dropped in and at once coupled up.

The speakers who discussed Mr. Forbes' paper expressed high approval of his suggestions. Mr. Bowles said that for the last three years he had been engaged in preparing standard plans—some of which he had restandardized several times—for customary fittings on board ships, eyebolts, blocks, pulleys, ventilator rings and ventilator coils, etc. Such standardizing must lead to enormous savings, the articles mentioned being produced at less than one-third of the cost of irregular sizes, besides the economy in their universal applicability.

Mr. Kafer said that it must depend upon the manufacturers of the units to bring about uniformity.

Mr. Wheeler, speaking for the pump-makers, said that they had considerable difficulty in teaching their customers. In the matter of the power for torpedo boats, some have a certain standard of their own which the builders have invariably to go by. Shipbuilding concerns might have standard engines beautifully worked out, and keep in stock immense quantities of parts that they could assemble at short notice; but then the fashion might change, and the enterprising builders would be the losers.

Mr. Du Bosque said that interchangeability of parts carried with it the best possible insurance. Six or seven years ago a very serious accident occurred on one of the ferryboats of the Pennsylvania Railroad, by which a cylinder was destroyed. A cylinder was taken out of a tugboat and placed in the ferryboat, the change being made in twenty minutes. Then two similar cylinders were made in the shop, leaving one spare one. They kept spare shafts also; six or seven shafts fitting fifty or sixty boats, and so with other parts. They had had ten separate engines built in the last four years by four different firms, and almost any part of either will fit any of the others, because they had insisted upon it.

Mr. Forbes, in conclusion, said that the United States Navy should be the party to start the system. It costs money, of course, but it will save an immense amount, and it will not only save in the beginning, for everyone knows that repairs in ship work soar swiftly upward. If we can be sure that a thing can be changed *in toto*, we will know certainly that a ship can sail at a given time and in proper condition. The rush work necessitated by the immense amount of capital lying idle in a boat at the dock results in work being slighted, and there is no way of getting around it except by adopting the system proposed.

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## English Views of Steam Engines and Machine Tools at Paris.

The Manchester Association of Engineers has made good use of the fact that some of its members visited the Paris Exposition by inducing them to submit papers and take part in the discussion of things seen there. From a report of the "Forty-fifth Discussion Session" of this association we take the following which will have an interest for our readers here as well as abroad.

Stationary engines were discussed by Mr. Alfred Saxon, who said:

The duty of describing, as far as the limited time will permit, the stationary engines exhibited at the Paris Exposition has devolved upon me.

These engines are for running purposes, chiefly arranged for generating electricity, one or two examples for mill driving being exhibited but not working, so that electricity has dominated this section of the exhibition almost absolutely.

Time will not permit of going beyond the category allotted to me, or it would be interesting to refer to the 1,000 horse-power gas engine, the steam turbine engines of the Parsons and De Laval types, blowing engines, rolling-mill engines, and also marine engines, which were exhibited. The exhibition may fairly be said to be the largest, most comprehensive and cosmopolitan in the stationary-engine class ever brought together, and to give the members who have not had an opportunity of visiting the exhibition an idea of the variety and extent of the exhibits, I may say that France alone, in engines of 300 horse-power and upwards, is represented by approximately 20,000 indicated horse-power; Germany comes next with 10,000 indicated horse-power, followed by Austria with 5,000 indicated horse-power, and Switzerland next with about 4,660 indicated horse-power; England only holds fifth place in importance in the size and extent of its exhibit with 4,230 indicated horse-power; then follows Belgium 3,200 indicated horse-power, Italy 2,000 indicated horse-power, Holland 600 indicated horse-power, and Russia bringing up the rear with a pair of engines developing 350 horse-power. America is not represented directly, but the Societé Française de Constructions Mécaniques exhibit a 3,000 indicated horse-power engine of the cross-compound vertical type, made to the designs of E. P. Allis, of Milwaukee, United States, which I have included in the French exhibit.

The grand total of the horse-power of the exhibits of the various countries mentioned amounts approximately to 50,000 indicated horse-power, which can be divided between the two principal types of stationary engines—horizontal and vertical: the vertical type accounts for about 16,500 horse-power and the horizontal type about 33,500 horse-power—twice as much.

The three largest engines exhibited are of the vertical type, each capable of developing 3,000 indicated horse-power, the well known Willans type high-speed engine representing England; France and America are represented by the E. P. Allis cross-compound vertical engine already mentioned, while Germany's reputation is sustained by the Borsig engine, which is a tandem four-cylinder triple, with power passing through two cranks.

The largest engines of the horizontal type are three of 2,000 indicated horse-power each, two being representative of French practice, by a Lille firm, one of the two pairs being a cross compound aranged for rope driving, but not working, and the other a pair of tandem four-cylinder triple expansion engines for electric driving, with Corliss valves all placed on the bottom of cylinder; the other engine, representing German practice, with the Sulzer type of valves, was also a tandem four-cylinder triple expansion engine.

Speaking generally of the engines, they included all well-known types: Single cylinder, compound, triple, and one or two cases of quadruple expansion, an Italian firm exhibiting a quadruple expansion engine developing 800 horse-power, of the vertical type with cylinders arranged tandem fashion, the power being transmitted through two cranks.

Engines of the single-cylinder type of large size were met with only in the French section, and although we should

consider them to be a wasteful type and very much behind the times, still they are working generating electricity; one of these engines is capable of developing 1,200 indicated horse-power and two others 1,000 horse-power each.

If time permitted, the arrangement of the cylinders of the various types would be interesting to refer to, but I must pass on to notice the effect of the development of electricity and its influence on the steam engine.

The first point is that in the direct generation of electricity from generators placed on the crank shaft, the number of revolutions in all types of engines has been considerably increased, with the result of the enclosing, or partial enclosing, of the principal moving parts. One of the most striking features in the horizontal type is the introduction of elaborate circular splash guards round the cranks and connecting rod ends. The influence of speed has also caused the lubrication of the various parts of both horizontal and vertical engines to receive very considerable attention, and is also to be noticed in the valves, and the gear for working same many ingenious arrangements being exhibited, but the type of valve and gear mostly in evidence is that of the well-known "Sulzer" type, which works excellently and noiselessly at high speeds. It is exhibited by Swiss, German, French, Austrian, Belgian, Italian and Russian firms, and also by an English firm for the admission valves only. This would seem to be the most cosmopolitan type of valve in the whole of the exhibition. The valve next in poplarity to the Sulzer is the Corliss. In some cases a combination has been effected of the Sulzer and Corliss, but invariably the Sulzer is, I believe, in such cases used on the high-pressure, or governing cylinder, and the Corliss on the low-pressure.

One noticeable feature is the limited use of the piston valve and the almost universal discarding of the slide valve. Speaking of valves and valve gear, it is interesting to observe that in the Belgian exhibits, which consist of three engines of the horizontal type, one of the firms exhibited the Sulzer type of valve, another the Corliss type, and the third the piston valve.

The engines generally were well and accurately finished, with one or two noticeable exceptions; most of them were arranged with the cylinders and covers steam jacketed, and to work with superheated steam. Many of the engines are fitted with electrical barring arrangement. Great attention has been paid to detail. The lagging of cylinders, splash guards, drippers, lubricating arrangements, painting, hand-railing, floor plates, staging and all accessories are, as a rule, finished in a most workmanlike and even artistic manner. Great taste has been displayed throughout by those responsible for the production. If I had to come to a decision as to the engine which pleased me most, I should select one representing Belgium,* although Switzerland is undoubtedly close up. Perhaps the most striking exhibit was that of Germany, as represented in the Borsig engine.

And now, Mr. President, having outlined what struck me as the leading points in the exhibits, I wish to deduce the lessons to be learned from them.

The first thought that struck me is that English engineers are not behindhand in the principles and ideas connected with steam-engine practice, but that we do not pay sufficient attention to details and to finish, and that artistic design is very much lacking in our productions.

We must recognize more than we have done that the development of electricity must gradually displace our present arrangements of gearing, and be prepared to adapt ourselves to this new condition of things. High speeds are inevitable, and better design and workmanship will be absolutely necessary.

Further, technical education is necessary for the employer as well as for the employee. The foreigner, generally speaking, is better educated, more artistic, and consequently appreciates to the fullest extent the influence that perfection in detail has upon the complete machine.

English engineers may with advantage take up the Sulzer valve and gear. Steam jacketing and superheating are worthy of more attention.

More expensive engines, which the continental type of engines seem to be, will be sought after by our customers, especially if the high price of fuel is maintained. We must not hesitate to copy the best designs of any country if we cannot design anything better of an original character ourselves.

In conclusion, I would say that English engineers must obtain more capital for the development of their business, and at any rate, those who carry on an export trade must be to the front in the exhibitions of the world. No doubt it will be urged that English Governments do not give the encouragement to our exhibitors that other governments do to theirs, but for all that the English engineer must not consider himself too busy or be too indifferent to enter into healthy competition with foreign engineers for the markets of the world.

Machine tools were discussed by Mr. Samuel Dixon, who said:

. . . In no branch of engineering do I think there is a more general or international display than in that of machine tools, for not only are there typical exhibits from France, Germany, England and America, but also from Austria, Switzerland, Sweden and Italy, and even from Russia. Compared with the two previous exhibitions at Paris, one is first struck with the very great advance made in every country (particularly in the last ten years) both in the design and construction of machine tools; for although there are yet many evidences of crude design exhibited, yet, on the other hand, there are many excellent examples of good design. Another prominent feature is the seemingly high quality of the workmanship throughout almost all the leading exhibits, and one cannot but admire the excellent taste displayed by many continental workmen, particularly in the finish of details; but whether the machines also possess all those highly essential qualities of accuracy, as distinct from mere polish and finish, it was impossible to determine from inspection.

There was ample evidence, however, that high mechanical skill is not the monopoly of any one firm, or of any one country. There was also much greater evidence of the true application of sound workmanship to strict utilitarian purposes —*i. e.*, where really necessary—and a remarkable diminution of those displays merely for the purposes of ornament. Again, there is an absence of that attempt formerly made by some firms to show evidence of extreme refinement, in some parts of machine construction, where it was quite unnecessary. One then saw the racks and pinions of planing machines made by one large firm in tool steel, with all teeth cut out of the solid by end milling cutters, as in slot drilling, leaving flanges on both sides of both racks and pinions, and even going so far as to harden these and grind every tooth—the whole at a prodigious cost.

The question of the relative sizes of machines exhibited is only a secondary one, depending often on circumstances beyond the control of individual firms. The largest were undoubtedly in the French and German sections, mainly due to the fact that ample space had been allotted to the firms, and the machines were ultimately destined for one of the government arsenals—in fact, ordered beforehand so that they would be exhibited.

It is extremely difficult to classify machine tools on a strictly scientific basis, but the great family easily subdivides itself into two great sections: First, machines for general engineering workshops, each designed to take a variety of work, and, second, special machine tools designed for specific purposes, among which we may put the automatic machines, though these take numerous objects of similar design.

Among general machine tools there was a somewhat remarkable absence of planing machines, though the rapid supercession of most planing operations by the milling machine doubtless accounts for this; yet of those exhibited, not excepting the American, there was not one at all equal to the best English planers, though, unfortunately, there was not an English one exhibited. Those exhibited were lacking in some of those elements of solidity and essential design for sound, heavy cutting.

*Probably that of our friend Bollinckx of Brussels.

There were good English examples of the overhung side planer, but I was surprised to find that the strange freak known, I think, as an open-side planer, and which I first saw in America in 1890, had been taken up by a German firm, and a fairly large size shown. This is very like an ordinary planer with the off-side upright removed, leaving the cross slide projecting and carried by one end on the front upright. The work reciprocates as in an ordinary planer, but when a broad object is put on the table the overhanging part is supported (as I saw it in America) by a roller running on a rail on the floor. The quality of the work from such a device can be easily understood, but one cannot imagine anyone buying such a machine.

Among slotting machines there was nothing new, and among shaping machines on one large American stand there was an amusing copy of a Whitworth shaping machine, not as made to-day, but as made and illustrated thirty years ago. The copy was not merely in quick return motion but in details down, even to the ratchet palls with triangular bosses and springs. I can only regret that in this section there was not a good English shaping machine exhibited.

Among boring machines there was one fine machine for boring and milling large engine cylinders up to six or seven feet diameter, and similar work. This had all motions driven by independent electric motors and was elaborated to such a high degree that it would require a very highly skilled man to understand even the machine itself, let alone the work.

Among drilling machines there were many evidences of improvements, particularly among radials.

Among light engineers' lathes there was strong evidence of the influence of American design, for where there is only very light cutting these light lathes suit the light-built Frenchman admirably, but where there is heavy cutting to be done the English lathes of the highest class (not the merchants' article) have nothing to fear in the rivalry of the German or American types, and though gibbed carriages and beds, for a generation the established practice in England, are now claimed as novelties in American construction.

Of the great modern family of milling machines, not only for light manufacturing purposes, but also for heavy engineering work, there were many good examples, and strong evidence of the development of milling, lending itself as it does with great advantage to the machining of objects formerly done on planing, slotting and shaping machines.

Among the milling machines for light manufacturing purposes the Americans showed to advantage, but among heavy machines for general engineering work the best examples were undoubtedly to be found in the English, German and French sections. In some cases it would seem as if the designer had only considered the geometrical question of revolving the cutter and reaching to desired positions, but the far greater question of stability of cutter, when a heavy cut comes upon it in any of these positions, had often been neglected or only indifferently provided for. The increasing practice of cutting the teeth of most wheels led to many automatic machines being exhibited for cutting both spur, scroll and bevel wheels; the most original machine for cutting bevels, in which both sides of a tooth are operated upon, hailed from Salford.* French constructors have a remarkable preference for helical teeth in wheels, and it is carried so far as to make even many bevel wheels with helical teeth, and though the advantage is, I think, of little or no moment, yet it has led to the exercise of much ingenuity to accomplish same.

Among boring and turning mills there was an extensive display in the French, English and American sections, showing the popularity of the machine for certain purposes. In screwing machines for bolts and tubes, where the display was mostly between the English and American sections, I think all engineers will agree that the English more than hold their lead. In steam hammers I must not omit to say that I consider our English makers were well in front and made a good display.

Among the truly automatic machines, as distinct from machines with usual self-acting motions, there was a fine display; and here again, strange as it may seem, in a field which was once claimed as peculiarly American, the best machines for engineering work were of English construction.

It is curious what an amount of claptrap appears in the daily press about automatic machines, and even in some engineering journals where special knowledge might be expected. The blessed word "Mesapotamia" was never in the running compared with the word "automatic" as one to conjure with, for we find it used just as if machines existed (of course, in America) into which it was only necessary to feed pig iron and steel bars and then by setting an index plate we could get marine engines, locomotives or dynamos turned out ready for delivery, one man minding ten machines.

In their true position as machines for producing small screws, studs and pins—in fact, the "smallwares" of engineering construction, they are of great value where large quantities are required, but where small quantities and varying designs are required, as in very many engineering works, the established English design of universal capstan lathe exhibited well holds its own.

There were also several prominent examples of the special lathes, introduced in recent years, for boring and turning cast-iron parts, such as cylinder covers and similar forms, by the use of broad cutting tools mounted in a capstan rest. With soft American cast iron this method is in many cases quite practicable but with the comparatively hard metals of Europe the results seemed far from satisfactory; for although the surface was fairly machined, yet the object would require mounting again and further finishing before being sent for polishing. Some of the lathes for this purpose were also exceedingly complicated and even clumsy, and any attempt to work them with unskilled or low-class labor would have most disastrous results in breakages; in fact, nothing but a very highly skilled man could be set to work them.

There was one fine automatic machine for turning and boring small castings, which were fed into a hopper, these being chucked, bored, turned and cast off automatically and completely finished. The irregularities of castings, however, soon set a limit to the application of entirely automatic machines, even the inequalities of round bars for the automatic screw-making machines play havoc with them, and render cold-drawn bars a necessity.

As connected with machine tools, I would mention the remarkable exhibit of tool steel by the American Bethlehem Company, which allows of stiff steel forgings being turned at a cutting speed of 140 feet per minute, or seven times quicker than the present rate. This will doubtless have a considerable influence on the construction of machine tools in the near future.

Of the great family of special machine tools, such as are so largely made by leading English firms, there were but few examples, as such machines are not suitable for exhibitions.

Reviewing the exhibition as a whole, it is evident that the important part which machine tools play in the productive capacity of a nation is becoming much more generally recognized, and engineers are becoming more alive to necessity of putting down only the very best.

The very best does not of necessity mean the most elaborate machines, for among many machines exhibited this elaboration of mechanism has been carried to an inordinate degree, many being extremely complex, though wonderful studies in mechanism. There is evidence, I think, of a reaction against this elaboration and attempt to make each machine do everything, and the best established English and European practice of having most machines specially designed for the particular manufacture is coming into more general favor, and its importance appreciated.

In the future I think that English makers will continue to have the strong German competition to meet in European and even colonial markets, even more than in the past, and more than that of any other country, not excepting America; but of the Englishman's capacity to hold his own I have not the slightest doubt.

*The Smith & Coventry machine illustrated and described in our No. 40 last year.

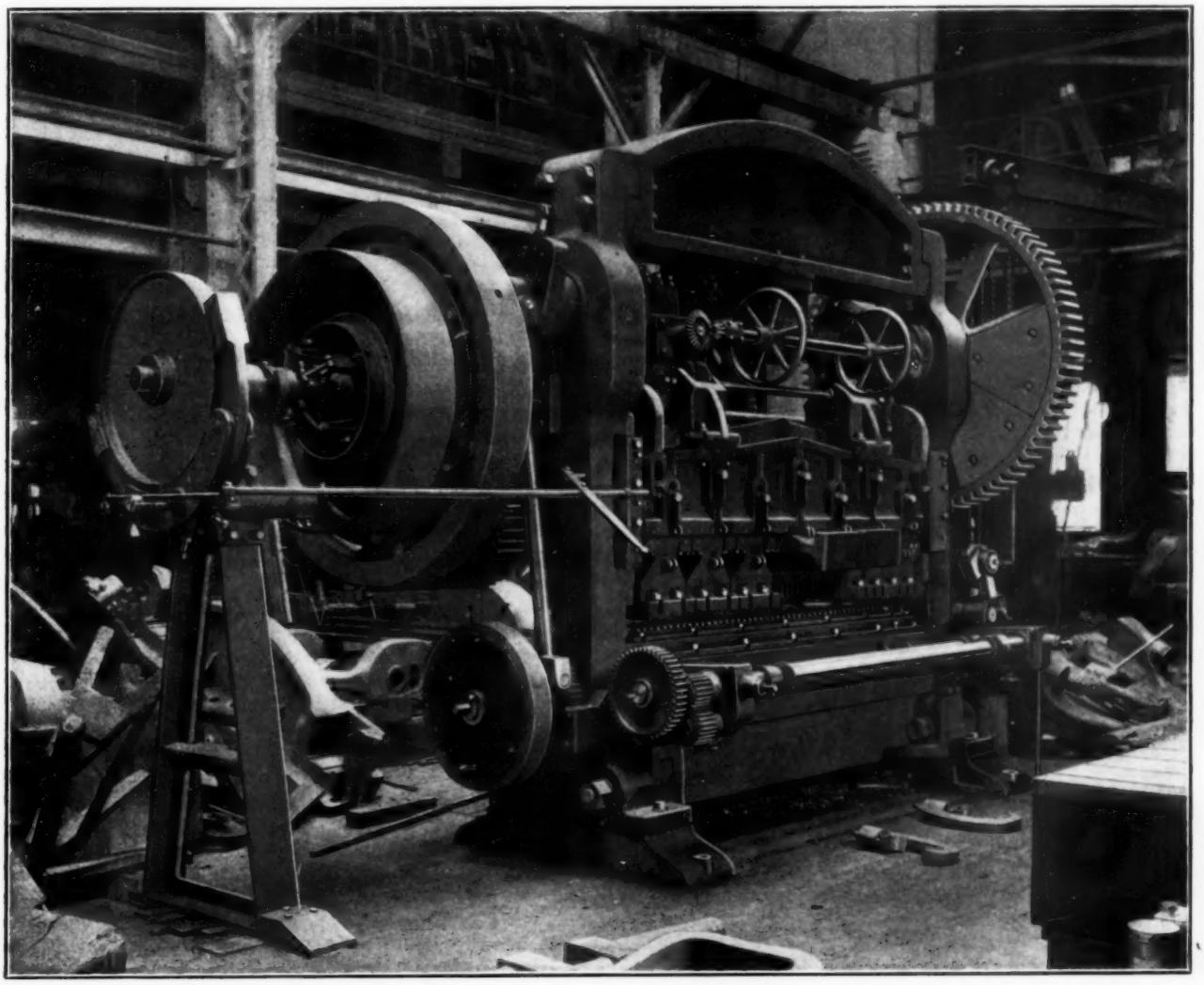
## A Large Automatic Roll Feed Perforating Press.

The half-tone shows a new and interesting gang punching press in the spot where it was first erected and tested. A striking feature, which is very evident, is in the size of the press, which is possibly the largest of its kind ever built, carrying a slide with 10 feet between the housings. Although the holes punched by this press are usually not large, the numbers of them throw an enormous strain upon the frame, and this has been borne in mind in the design. It will be seen that the bolts alone are not depended upon, as the sides hook on to the ends of the upper girder, and similarly hook into the base. The main shaft is of very large diameter, and the main gear is counterbalanced to equalize the weight of the slide carrying the punches. A cam-stripper slide is attached to the main slide, the former receiving its motion from cams on the main shaft. The clamping bar and the stripper are attached to the stripper slide. The clamping bar is made in small sections, two of which are seen swung up out of the way in the front of the machine. This makes the punches perfectly accessible, so that it is an easy matter to remove or replace any individual punch as required. Each slide has its own adjustment, so that the tools may be set as accurately as may be desired. The main slide which carries the punch bar is of easy access; it is set and held by adjustable gibs for taking up wear.

The automatic friction clutch by which the machine is driven can be arranged to work either by hand or by foot. In the machine here shown, the hand lever is used. By the use of this the operator can stop the press instantly at any point of either stroke. Where so many and such delicate dies and punches are used, it would be almost impossible to set and adjust them without this arrangement.

Another interesting feature of the machine is in the feed rolls. When in position one roll is under the sheet and another above it, with sufficient pressure to ensure certainty of movement. The feed for stroke is adjustable from 0 to 3 inches, and heavy sheets of metal are taken in up to ¼ inch in thickness. The feed rolls are here shown swung down out of the way for changing the dies. This dropping of the rolls or replacing them is quickly done.

It goes without saying that in a machine as costly as this full attention has been given to all its minor details, so that in this massive press are combined all of the features usually embodied in a small, quick-running, watch-tool press. The weight of the press is about 80,000 pounds. It has just been built by the E. W. Bliss Company, Brooklyn, N. Y.



A LARGE AUTOMATIC PERFORATING PRESS.

## A Master Patent for Automobiles.

In the United States a master patent is held by the Electrical Vehicle Company, and unless it is upset by the courts, there is every likelihood that a royalty can, and will, be claimed on every , etroleum-driven automobile in that country. The patent was applied for by Mr. George B. Seldon, a patent attorney, on May 8, 1879; that is nearly twenty-two years ago, and it has yet nearly twelve years to run. The idea of taking toll on a flourishing industry for twelve years is enough to make all the dead-and-gone inventors turn in their graves. The whole affair is a revelation of what can be done under the United States Patent Law by one who has studied

its peculiarities. It hinges on the fact that up to 1897 an application for a patent was not considered to be abandoned until two years had elapsed without a reply from the inventor to an objection raised by the Patent Office. It was therefore only necessary to incorporate in an application something to which the authorities would be sure to object to obtain two years' extension of time. In Mr. Seldon's case the correspondence and negotiation occupied from May 8, 1879, the date of the application, to November 5, 1895, the date of the patent, a period of sixteen and a half years. According to the "Scientific American," the application was rejected on May 31, 1879, and an amendment was filed on May 26, 1881, after an interval of two years, all but four days. The amendment was rejected on June 17, 1881, and was followed by a second amendment on May 15, 1883. This was rejected on May 26, 1883, and a further amendment was filed May 18, 1885, this time seven days being saved from the two years. An official letter sent to Mr. Seldon on June 15, 1885, was not acted upon until June 13, 1887, only one day before the expiration of the two years of grace. Another rejection on June 21, 1887, was answered by a letter dated April 13, 1889, and by an amendment filed June 10, 1889. Mr. Seldon was requested on June 14, 1889, to furnish a "smooth copy" of the specification prior to issue, but although the specification was otherwise ready for allowance, it was not until June 5, 1891, that the substitute specification was filed. An official letter of July 1, 1891, demanded a new oath prior to issue; the oath was taken on June 28, 1892, less than a year being required in this case. Then fortune intervened in Mr. Seldon's favor in a remarkable manner. This case was transferred to another examiner, who took a different view of it from his predecessor, and on July 29, 1893, he rejected some of the claims previously allowed. The next amendment was filed on April 1, 1895, and the patent was finally granted on November 5, 1895.

It will be remembered that at the date of the first application the automobile was scarcely thought of, and a patent with seventeen years to run would not have been of great value. At the date of the grant, however, the manufacture of automobiles was being taken up in all the great centers of America, and there was the prospect of a business the magnitude of which no one can predict even now. The delay has converted an invention which was far ahead of its time into a patent which has arrived like a bolt from the blue. Further, it has enabled every one of the original claims to be abandoned, and new ones to be drawn in the light of fuller knowledge. We do not know whether the later claims are wider or narrower than the old ones, but they are certainly wide enough. The first reads thus:

"The combination with a road locomotive, provided with a suitable running gear, including a propelling wheel and steering mechanism, of a liquid hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device, and a suitable carriage body adapted to the conveyance of persons or goods."

It would be a very difficult, if not an impossible, task to design a petrol automobile that did not infringe this claim; and certainly the attempt would not be worth making unless the holders of the patent endeavored to suppress the industry. It remains to be seen what the American courts will do. Already one case has been tried in the United States Circuit Court of the Southern District of New York. It was urged that the patent, on its face, was void for lack of patentability; that the specification conceded that all the elements of the combinations of the claims were old; that steam engines had long been employed to propel road wagons; that liquid fuel had been used to generate steam, and that gas engines were old, and their use, as well as that of other motors, and been proposed for tramcars and like vehicles. It was argued that the substitution of a gas engine for a steam engine to propel a vehicle did not require inventive faculty. The judge, however, brushed aside all the arguments on the ground that matters were very different in 1879, and that what appeared very easy and simple now was not necessarily so at that date. The patent, therefore, stands for the present. It is in strong hands, but it is certain that the general body of manufacturers will not be disposed to admit its validity until they have taken the opinion of the highest court in the United States. Even a moderate royalty would amount to an immense sum which would be worth fighting for. Here we may congratulate ourselves that it is impossible to get a patent dated forward in this remarkable manner. —"Engineering."

This seems to be a case in which the United States Patent Office was made to do a thing not contemplated by the patent law, or rather we should say, to do a thing intended to be done by that law, although in a manner not contemplated by it. If we understand the spirit and intent of the patent law at all, it is designed to enable an inventor to make more or less money out of his invention—less if the invention is of minor or no importance, and more if it is of greater importance and is well managed. In this case, by taking advantage of a provision of the law or of the rules of the Patent Office, the inventor managed to carry the date of his patent over to a period when the public is likely to need it and to be willing to pay a fair price for the use of it; and we think every inventor, manufacturer and mechanic at least should be glad that he was able to do this. When the invention was conceived it was ahead of its time. If it had been issued at that time it would probably have netted the inventor nothing, if, indeed, it had not impoverished him by the missionary work involved in getting recognition for it. As it is, the patent bids fair to be what every patent should be, *i. e.*, a source of revenue to the inventor or his assignees in proportion to its value. The total cost of automobiles must still be such as to enable them to be introduced against the competition of the horse, or else the invention will still pay nothing. We do not pretend to judge of the intrinsic value or validity of the patent, or to say whether or not such a patent should have been issued; but granting that it was a proper and fair patent—that the inventor really had made an invention of a thing not previously known—then we think it is right that he should have taken a course calculated to enable him to get a return from it. That is one part of the bargain between the public and inventor when patents are issued. There may be a question as to whether so-called "master patents" should be issued at all or not, but that has nothing to do with the point we have been discussing.

## Economy Guarantees of High Speed Simple Engines.

Mr. E. J. Armstrong, of the Ball Engine Company, read a paper on the above subject at the recent New York meeting of the Engine Builders' Association, in which, among other things, he said it was his belief that the single-valve automatic is not always given a fair chance. The matter of economy does not always receive consideration. The engine that runs smoothly, noiselessly and punctually will have friends and purchasers whether it uses much or little steam. Mr. Armstrong had no desire to advocate improvement in economy to the detriment or neglect of other qualities which go to make up successful machines, but he believed that many engine builders had but a very imperfect idea of what their own engines were capable of. If the subject were more amenable to mathematical treatment, the case would be different; but in spite of the marvelous advancement in science at the end of the century, he believed that the exact formula for the economical performance of the steam engine has yet to be written. In view of the fact that the steam used by an engine often costs each year as much as the engine itself, it would seem as if the customer might consider steam economy as of first importance and price as a bad second. Yet even a small difference in price or a personal preference will decide a purchase without raising the question of economy at all. A difference of 10 per cent. in steam consumption between two engines might easily place the more wasteful one in the position of being too expensive, even as a gift; but there is no doubt that there have

been, and still are, even greater differences than this between engines that are sold on equal terms. It is singular that customers who figure so closely on other matters should be so careless and unbusinesslike in this, or that builders should expect to market engines with no economical record and not even a pedigree. Mr. Armstrong believed that this rather anomalous condition of things would soon be brought to an end; that for years there had been an increasing tendency among customers to raise the question of steam consumption, and that builders of engines must recognize and prepare to meet a demand for definite promise and performance in the matter of economy.

This should be welcomed, not as a hardship, but rather as an opportunity. It is essential to obtain more exact data concerning the performance of automatic engines, and in making efforts to improve the quality of work turned out, the first step is a systematic effort to find the defects in that work. The first move in reducing cost is to find out what things are costing, and the way to improve the economy of engines is to test them systematically and to learn their deficiencies.

It is not usually practical to test engines of small size after installation; the expense is disproportionate and the difficulties in the way of obtaining accurate results are great. The liability to error and the impossibility of running preliminary tests make it unsafe to make close guarantees to be demonstrated in this way. The proper place to test an engine is on the shop-testing floor. With properly arranged apparatus tests can be made there in a short time and at little cost.

In estimating the steam consumption of an engine of a size or under conditions which have not yet been tested, there were two ways of figuring; one was to determine the losses in the engines separately from the steam accounted for by the card. This method, while quite complicated, is the more accurate of the two and is sometimes very valuable in working out a close guaranty. The other plan is simply to learn the general effect of the different conditions which affect economy and to use some previous tests as a basis.

Mr. Armstrong added that the building up of a better reputation for automatic engines was well worth the attention of its manufacturers. No guarantee of economy should be given unless its fulfillment by actual trial is provided for. Where there is no certainty that a test will be made, there is the temptation to give a lower water rate than would be the case were its fulfillment one of the conditions, especially if accompanied by penalties for failure to meet the terms of contract.

This question of penalties, although considered quite onerous by engine builders, if not provided in the contract, the only penalty is the non-acceptance of the engine; and as this is often impracticable because of lack of time, there is a good chance that the guarantee is not worth anything. Definite penalties at least have the effect of protecting those who really make their guarantees in good faith and with a knowledge of what they can do. There is nothing wrong about it from the purchaser's standpoint. A deficiency in economical performance means a direct and continuous loss to him. . . . There is one feature of the situation that is manifestly unfair and calls for remedial action. Better economy costs money. It may not actually cost more to build the high duty engine than a wasteful one, but it costs a good deal more to learn how and to keep up the standard afterward. It costs money to tune an engine up to meet a close guarantee, and testing engines is an expensive business at the best. There should certainly be an addition to the price when guarantees are required. Mr. Armstrong suggested that all duty guarantees should provide for their fulfillment on the shop-floor test before shipment and should always be considered as an extra, it being optional in all cases with the purchaser to accept the proposal with or without the guarantee. If the guarantee does not mean anything, it should not be made. If it does stand for something, it costs a good deal and is worth to the customer all that he is likely to be asked for it.

## Mr. Hewitt on Social Conditions.

Abram S. Hewitt is evidently very much in earnest in his effort to arouse the rich people to a sense of what he considers to be their duty. We have referred to what he said a short time ago, and on the 27th of last month, at a meeting called to raise funds to carry on the work of the Pro-Cathedral in New York, is reported as saying:

"Since 1840 our national wealth has increased five times as fast as our population. Who shall say with that wonderful increase in wealth there is not means in abundance to remove all the misery and all the evil conditions among the humble classes which at present are stains and sores on our body politic?

"The advance of industry which has brought us this wealth beyond the wildest dreams of avarice has also brought on conditions which make it an absolute impossibility for some people to live decent respectable lives.

"The rich have not even begun to do what they ought to do. Men that I almost worship for their generosity and solicitude for those that have less, are not giving in proportion to their wealth the half that was given by their families a generation ago.

"Have we the right to take all this wealth and do nothing to correct the evils created in its production? Can you accept these millions and shut your eyes to the evils which weave themselves about the producers?

"Can anyone be content with such conditions? Good God! Can this be the end to which we have been working all these centuries? For Heaven's sake, is this the result of our industrial development, and must our prosperity as a nation be purchased at such a staggering price? If these terrible tenements, these overcrowded districts, these dark and foul dwelling places, and all the attending miseries must go with industry, then I would to God that every industrial center could be destroyed as was Sodom and Gomorrah of old and men be driven back to the land where they can at least have the breezes and the green grass and the sunshine and the blue of heaven to look up to."

## The Stimulus of Foreign Competition.

It is annoying to the German steel producer when Americans succeed in laying down steel in his own territory, but it may be for his welfare that this should occasionally take place. In a report from Frankfort, Vice-Consul-General Hanauer writes:

"Mr. Wiegand, the director-general of the North German Lloyd Steamship Company, at a public festival, made a speech in which he defended his country against the attacks made on it by German industrial circles on account of the company's late purchase of 1,000 tons of steel in the United States. The director said:

"'We have, during the six years past, paid to German industries over 130,000,000 marks ($30,940,000), about 22,000,000 marks annually. The order given to American steel works, amounting to about 300,000 marks, is insignificant, compared with these figures. It is not to save 10 per cent. in price that this order was given to a foreign concern, but the Lloyd Company would not have reached its present position had it not utilized the improvements offered by outside manufacturers. We would like to see German industry brought to the utmost tension by foreign competition, and not afraid to meet it at home; hereby the only possibility exists for us to maintain our place in the international contest for economic fitness.'"

The Common Council and Board of Aldermen, Providence, R. I., have passed an ordinance giving the Union Railroad Company, a trolley system, the right to interchange freight cars with the New York, New Haven & Hartford Railroad. It directs the latter to haul freight cars along India street to and from the tracks of the former. Although this measure is specific and local, it is foreseen that the principle involved may be extended so as to make trolley roads elsewhere a factor of competition with steam roads in heavy freight traffic. This competition would seem to lie between the up-country trolleys which run through manufacturing or agricultural districts and the parallel steam lines tributary to the trunk roads.

# Letters from Practical Men

## Using Phosphorus in Brass Founding

Editor American Machinist:

Will you inform me through the columns of your paper how the phosphorus is used, referred to in the articles on "Brass Founding," in Nos. 44 and 45, 1900, or rather how it is handled, as it is not safe to touch with the bare hands? Is there a specially prepared phosphorus for this purpose, and if so, where can I get it?

B.

This inquiry was referred to Charles Vickers, author of the articles to which it relates, and he has replied as follows:

Editor American Machinist:

For the information of your correspondent, regarding the use and handling of phosphorus, allow me to state that there are several ways of adding it to alloys, viz.: by the use of phosphide of tin or phosphide of copper, and by using stick phosphorus. The tin phosphide (or phosphor tin, as it is called) is the best and safest, and for making phosphor bronze gives superior results. Experiments which the writer has conducted have shown that common casting copper, made into bronze by the use of 5 per cent. phosphor tin, possesses a tensile strength greater by 10,000 pounds per square inch, over Lake copper made into bronze by the use of block tin and stick phosphorus.

Stick phosphorus should be kept in water in an earthenware vessel (as metal vessels are liable to leakage, allowing the water to drain off and the phosphorus to ignite). It should be taken out of the can in which it is purchased, and the sticks broken by lightly tapping with a small hammer holding them in the hand meanwhile. A few crystals of blue vitroil should be placed in the water, and when the phosphorus is coated with copper, it should be placed in clean water and the water kept clean by changing at intervals. Phosphorus thus copper-coated has been kept out of water several days, and even carried around in the vest pocket. Such a proceeding, however, is not recommended by the writer. Never allow familiarity to breed contempt when handling dangerous articles or substances; and however thoroughly protected the phosphorus may be, handle it quickly when out of water. Naked phosphorus, when taken out of water and placed on a board, ignites in about seven minutes at an ordinary temperature, say 82 degrees.

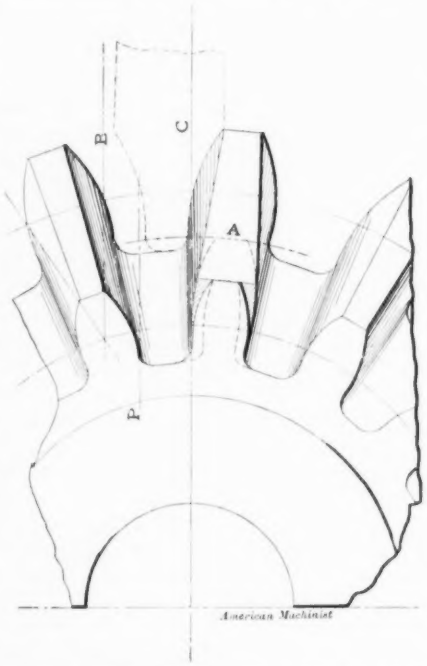
When adding it to alloys, take the metal from the fire, put the required amount of phosphorus in a vessel containing water, and throw it piece by piece on top of the metal, stirring gently, changing the stirrer when heated. Do not attempt to dry the phosphorus, nor invent schemes for plunging it beneath the metal. The writer has tried them all, and they are all fruitful causes of accidents. Neither friction nor heat can be used to dry the phosphorus, and time is short, as the metal won't wait. The water on the phosphorus does no harm when the latter is thrown on top of the metal. If you imagine you are losing all your phosphorus by this procedure, take two pieces of equal size, ignite one on the floor, throw the other on the metal, and you will find that the latter piece is absorbed in a short time, while the fumes from the burning piece on the floor will drive everyone out of the shop. In regard to these fumes, do not breathe them, but get the smoke out of the shop as quickly as possible, as it is highly poisonous.

Chicago, Ill. C. Vickers.

## Milled Bevel Gear Teeth.

Editor American Machinist:

In No. 46, 1900, the question is asked, "Can the space between two bevel gear teeth be cut theoretically correct with a single milling cutter with a single cut?"




CUTTING BEVEL GEARS WITH A ROTARY CUTTER.

Permit me to supplement your reply with the inclosed sketch, showing the conditions involved.

The cutter *C*, on one side of the pitch line with the tooth on the other side, advancing toward the apex of the cone or gear blank, produces the form as shown at *A* if the cog were of parallel hight; but as the top is decreasing in hight the top lines are diverging instead of converging and the small end of the tooth has the surplus metal shown by the section lining.

In order to obtain a correct top line, the tooth is shifted to the right, the cutter following, the result being as indicated by the dotted lines. The metal from the top down is cut away below the proper size and the tooth must wear on the outer end about twice as much before it will come to a full bearing from end to end. The effect of carrying the cutter beyond the center is shown on line *B*, the cut reaching the center of the tooth on the small pitch line, and if repeated on line *D* the tooth would be cut entirely away above the pitch line. The cutter must always be small enough for the narrow end of the cut as indicated by line *P*.

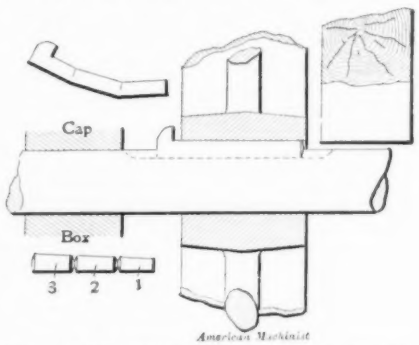
It is self-evident that converging surfaces cannot be produced by a cutter simultaneously and any milled bevel gear is an abortion, the defect being most conspicuous in the longest faces and largest sizes. Bevel gears with theoretically correct surfaces, both in metal and in wood patterns, cut by special machinery, are now supplied and there is no excuse for using the abortions of the milling cutter in first-class machines or as patterns, in which latter case the botch is reproduced without limit. F. M. Schorn.

Buffalo, N. Y.

## How a Line Shaft Pulley Was Fastened.

Editor American Machinist:

There was a ¾-inch key loose in a line-shaft pulley and a new one had to be fitted.




HOW A LINE SHAFT PULLEY WAS FASTENED.

The sketch is an effort to show the situation. A box on one side and a timber close to the rim on the other side did not allow any shifting of the pulley. A key-drift and a hacksaw were used, and the key came out in a shape as shown at *A*. The new key had been made in the shop and finished on three sides. This key was cut in three pieces, and after each one had been fitted in its right place they were driven home successively.

J. Schuring.

Milwaukee.

## The Compound Rest for Lathes.

Editor American Machinist:

Is the compound rest of prime importance? I believe, by what we hear from witnesses over the water, that they think so. Many on this side certainly think that its room may be better occupied, say, with a hight adjuster or with solid iron.

Are the circumstances of the two parties different, or has one of them got an eye shut? Now, what are the uses of the compound rest? I will mention some that I know. Perhaps there are others.

First, it is handy for boring taper holes; but this alone, according to our ideas, would not warrant it on every lathe. Second, most lathes are screw-cutting. An Australian (or New Zealand) correspondent makes a point which, if well taken, as it appears to be, calls loudly for the compound rest on every screw-cutting lathe. I confess when he mentioned it it was new to me.* It is thus: In cutting a V-screw, say, of 60 degrees, place the compound rest at 30 degrees and feed in the tool with the compound rest. The tool would cut altogether on one side. A tool properly ground would thus rough out screws in half the time needed otherwise. Now suppose you put a pin in the apron, preventing the cross-screw crank from making more than one revolution. Use that screw for withdrawing and returning the tool and the compound rest for feeding in. Thus a special contrivance for withdrawing the tool in screw cutting is avoided. All cross screws should be as coarse as 2 per inch.

Third use for the compound rest: Mr. Lathehand, how do you draw back your tool on a gib-rest lathe when it is cutting a trifle too deep? We will say the lathe has no back screw tool elevator—that being an intolerable feature on a gib lathe. It is obvious that the uncertain back-lash of the cross slide on its screw precludes the use of that, unless it is used loose to a vicious degree. Well, this is the way I do it if the lathe has a compound rest. If it hasn't, you'll have to tell me some satisfactory way to do it. Thus: Set the compound rest to some angle, say 30 degrees, and keep it there for all turning and facing; or, if your style of tool-holder calls for it (and the best style does), set it about square with the cross slide when facing. Now gib the compound rest so hard that it will not back-lash on its screw, turn the crank backward till the slide starts, and leave it so. You are now rigged for setting in with the cross screw and out with the compound rest, and the compound rest is hand gibbed, as it ought always to be when not used for feeding. I have been told that the curious tool elevator on Sellers' smallest lathe was really put there to make minute setting in and out manageable. This third use of the compound rest would seem to almost warrant its presence on any gibbed lathe; but wait till we hear from the lathe hands.

Fourth use of the compound rest: For hand feeding. I suspect we shall have to cross the water to see much of it. We Americans use the automatic feed even for very short cuts, and kill a lot of time doing it. The hand feeder uses very different tools from those adapted to self-feeding. They are straight-ahead tools—that is, they turn up at the end and feed alike right or left. The underside clearance, both sides and front, is extreme. The turn up in front is slight. I cannot give you the angle just now, as I have nothing by me to measure it, but it is peremptory. It may be from 10 to 15 degrees. The speed used with these tools is high. The sense of touch comes in, and they are fed to their limit, but not over it. Witness the speed used with a thin diamond-point hand tool; could you imagine it with a power-fed tool? There are touch and humoring and intermittency.

Many years ago an English "turner" came to one of our principal workshop cities. He had never run an engine lathe, but they put him on one in a not over-fine shop. He became famous as an efficient lathe hand. I was in the shop one day, and having heard of him, took a look at his tools. I was astonished. There were plenty of them, but there was not a right or left among them; they were straight-ahead tools, and he was a hand feeder. No doubt he was lame in not having some proper power-feeding tools; but I took a leaf out of his book and adopted the round-end, straight-ahead tool in different sizes, and it has been received as an acquisition by every lathe-hand, on acquaintance.

Well, your Britain, and maybe your continental, is a hand-feeder, and what has that to do with the compound rest? Why doesn't he use his carriage feed? Well, now, what if there is no carriage? With many or some old-country men the idea of a lathe to turn iron is a back-geared hand lathe with a portable slide rest on it or on the floor under it. But suppose he has an "Oriental" lathe with a carriage on it. Is the carriage hand-feed fit to use? From what I have seen of old-country work—considerable seldom. A 2 or 3-inch pinion working in a screw for a rack and no gear-down is a good thing to let alone. No wonder they use the slide rest for hand-feeding. Many of their lathes move the carriage 6 inches or a foot at a turn.

So that is one reason they've got for wanting the compound rest; but we have certainly not got that reason, as our carriages usually move about 1 inch for each turn; though we have some builders who have found it handy (for the designers) to make them move about 4 inches. We have had in the "American Machinist" an Englishman growling because our carriages move so slowly. He is evidently satisfied to twiddle with a 2-inch crank on a compound rest, and only wants his carriage feed to hustle it the whole length. To conclude, we don't want the compound rest for hand-feeding, but on the whole I guess we want it. H. W. P.

*This had been previously described in our columns by Prof. Jno. E. Sweet.—Ed.

## Superintendent Wanted.

Editor American Machinist:

I was forcibly reminded of "Superintendent Wanted" by a visit from my old friend Oliver, a few days ago. He and I had worked at White & Dull's together, and he had gone to Golde & Brigley's, so I was quite surprised when I heard that, after a couple of months, he had gone farther West to Dolphan's as mechanical engineer. Naturally, I inquired why he had made the change so soon, and here is how he explained it:

"Golde has charge of the shop, while Brigley is the financial man and never interferes. Golde is what is generally known as a practical man—that is, he has been through the shop—but he is the poorest mechanic I know. He got mad at his general foreman and decided to remove him, so he came East to hunt up a new foreman. Someone recommended me, so he wrote me to meet him in Philadelphia, where he told me what was wanted, and engaged me at a good price to go back with him and take the place of the man he had decided to remove.

"By the time we landed at Chillicothe Golde had experienced a change of heart, and concluded that he couldn't do without the man who had been with him fourteen years. He also decided that he ought to have a superintendent, so I was given the latter title.

"About 11 o'clock of the first day I noticed some excitement in the planer department. On investigation, I found that Golde had noticed a planer countershaft jumping in an alarming manner under the influence of a job with a short stroke and a heavy cut, so he had ordered it braced against the line shaft by means of a 2½-inch pipe with a babbitted half-box at the end, bearing against the shaft. Well, the half-box got hot and burned out, while all the boys stood around watching it smoke and offering suggestions coupled with remarks somewhat derogatory to Golde's mechanical ability.

"I ordered the bracing to be done against a girder, and had an extra hanger put on the line shaft, close to the driving pulley, and since then no further trouble has been experienced at that point. Golde didn't like the change, and walked me down the shop to show me other similar braces which hadn't burned out. I quietly told him a shaft wasn't the proper thing to brace to, and that even if he had succeeded in making the thing work, it wasn't so good as bracing to something stationary.

"Golde is a very pompous chap who takes special pains to impress everyone with his high opinion of himself as a mechanic. The second day he came to me and took me down the shop to a double-spindle centering machine, and started: 'I bought this machine because I believe it to be a time-saver, and as our whole idea in this shop is manufacturing, I want it used; but I find that the men object to it on the ground that it doesn't center truly. Now, I want you to fit it up with taper journals, with proper adjustment to take up wear, as it is the slackness of the spindles that makes it center out of true.' I told him a taper journal couldn't be used on a spindle having end motion, and he

made a rough sketch of his idea, from which I learned that he meant a split box, tapered outside and parallel inside. I didn't think that a man of his pretentions had any right to mix up the terms journal and bearing; but I didn't tell him that. He went off to talk to a patron, while I examined the machine.

"I found that there wasn't any shake in the spindle; hence Golde's conclusions must have been jumped at (I afterwards found that to be a common failing of his). The chucks on the machine were scroll chucks, and when I examined them I thought of Tecumseh Swift, who doesn't have any more use for a scroll chuck than I do. I couldn't make those scroll chucks right, so I concluded not to squander any more money on the machine, and there it stands, a gold brick on its owner's hands.

"Next day I designed a tool for doing a little job they had been doing with a file. Golde happened to come along, so I foolishly showed him the sketch. He immediately ordered an improvement on my idea, and I hadn't the nerve to tell him it wouldn't work that way, though I knew it wouldn't. The foreman of the toolroom asked me whether I thought it would work, in a tone which clearly implied his unbelief, and I told him 'No'; but ordered the tool made anyhow. Well, it was made and it didn't work, after costing $6.43. If it hadn't been for that 'improvement' it would have saved fifty-four hours a month at 25 cents an hour, or $13.50.

"The next day I figured out an improvement in boring brass boxes, which the foreman and I decided would save $50 a month. Golde came into the shop and, without investigation, ordered a return to the old method.

"A few days later Golde bought another gold brick, in the shape of a second-hand machine that would have to be rebuilt to adapt it to our use. Now, as he was always preaching 'manufacturing,' I couldn't see why we should be bothered with rebuilding junk; but there it was, and I had to tackle it with men I needed to make jigs. We had some words over it, but finally he turned it over to me to fix my way. About a week later he rushed up to me and told me not to try impossibilities. On inquiring what the trouble was, I learned that he regarded a shrink fit of a steel collar on a cold-rolled shaft as an impossibility!

"Meantime the various foremen told me that in four years they had had forty superintendents! And Golde had told me he had always been his own superintendent. 'How long did the last one stay?' asked I. 'Three weeks,' was the reply.

"Now, Golde was a good salesman and at the bottom a very kind employer; yet he had such an absolute lack of both executive and mechanical ability that these men had all left in utter disgust before being in the shop long enough to thoroughly familiarize themselves with the product. I really feel sorry for him, as he is losing a lot of money through his anxiety to look after the details which he ought to entrust to the superintendent, besides stirring up the animosity of the man he is trying to help and ruining the discipline of the shop by giving orders to subordinates without having them pass through the proper channels. The fact is, the shop has outgrown his executive ability and he is floundering about in water too deep for him, and while he knows that something is wrong, he steadily refuses to see that the fault is his own.

"Thank fortune I found my present position, where my employer knows enough to let me alone, so I can have a chance to earn my salary. So soon as I found it, I shook the dust of Golde & Brigley's from my feet, and I trust it is forever."

Perhaps some of those superintendents Mr. Press tells us about might have a story somewhat like friend Oliver's to tell, if the matter were inquired into.

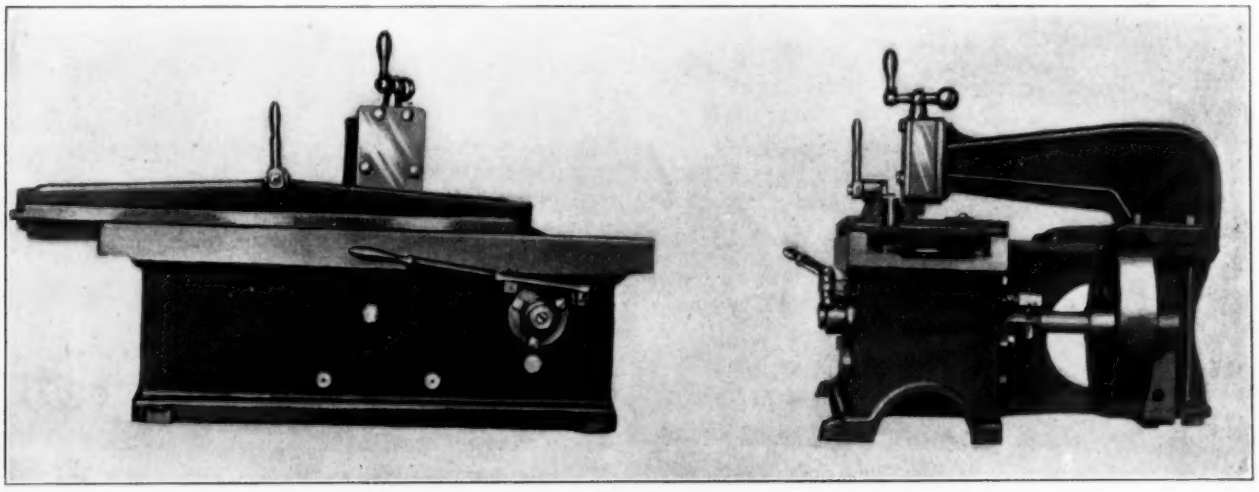
L. O. Danse.

Detroit, Mich.

## A Machine for Knurling Flat Surfaces.

Editor American Machinist:

It is seldom that flat pieces of metal require the print of knurling tools and there has been no demand for any special machinery for this purpose. Having work of this kind, I designed and constructed a machine embracing some novel features. The pressure required to knurl a flat surface is greater than when knurling a round piece in the lathe. The flat surface must be knurled in one pass across its surface, while in the lathe the work may revolve until the knurling tool has reached its depth. There was a question whether when the knurling tool was forced to the proper depth in the metal it would not hold the metal stationary and allow the bed of the machine to pass or slip along without it. The work must, of course, travel with the bed of the machine, and it is difficult to hold thin sheets securely. The machine was to be made for a wide range of work.



A MACHINE FOR KNURLING FLAT SURFACES.

Fig. 1 is a front view of the machine, showing the head for raising and lowering the knurling tool, and a small lever and attachment for holding the work against a guide and flat upon the bed. The long lever upon the front of the machine is for operating the driving and reversing gearing enclosed in the base. Fig. 2 is an end view showing the head and the general construction. The head is secured to an arm overhanging the bed and allowing considerable width for the work. The clamping lever is attached to an eccentric, and when the lever is turned down a bar secures the work to the bed and against a guide. The guide may be set forward or backward by means of slots in the ends and holes in the bed. The one driving pulley and its shaft run slowly and continuously. On this shaft are two loose gears with clutch teeth on the face of each. One of these clutches gives the forward or knurling movement, and the

other clutch gives a quicker speed for the return of the bed. A spring catch holds the clutch rod in a central position when no motion is required. The work of the machine has been entirely satisfactory.

Muscatine, Iowa. PAUL S. BAKER.

## Teachers for Manual Training Schools.

Editor American Machinist:

One of the most fundamental and far-reaching developments of the public-school system of America is the introduction and extension of manual training. This kind of education has become so popular that many a board of education is face to face with the problem of how to find the ways and means for carrying on such work. But a far greater problem is that of obtaining competent and skillful instructors for these schools, and much of the success of this system in the future will depend upon the proper training of those who are to have direct charge of the work.

It goes without saying that a shop instructor should at least be a good artisan, a good teacher and have a good general education. No one, however, will seriously question the statement when I say that this combination is a rare one.

From what sources are these teachers obtained?

Some instructors are taken from the shops and are presumably skillful workmen in the branch which they undertake to teach; others are graduates of our technical schools who possess a good general or technical education, but usually are not skillful artisans. Neither of these two classes can be considered as teachers—in the sense that they ever have had proper training in the art of teaching.

It seems to the writer that young men and women, who desire to follow manual training as a profession—and a most worthy calling it is too—should have some clear idea of what their preparation should be. It is not sufficient that such a teacher should have simply a school education. If a man, he should have had three or four years' experience in the shop, and if a woman, she should have had a proper period of actual practice in a real kitchen, a real sewing room or a real hospital. In addition, each one should give sufficient time to a careful course under competent teachers in pedagogy. Those who are looking ahead to a career of this sort should take and read carefully two or three leading educational periodicals in order to keep abreast of the times, educationally.

There is many a manual training school in this country where the shop instruction is of such a character as to excite the derision of almost a second grade mechanic; and, on the other hand, where the instructor is mechanically proficient, his treatment of pupils from a pedagogic standpoint is something atrocious.

In writing this letter, it is hoped that criticisms and suggestions will be brought forth as to the best methods for raising up a corps of teachers in our land to fill the thousand places which stand open for them. Would it not be better if instead of large bequests for schools and colleges, which are to be monuments to the success of some rich man, more money and attention should be spent in properly preparing the men and women who are to conduct the schools we now have and upon whom the quality of the product depends?

J. B. STANWOOD.

## Practical Mathematics.

Editor American Machinist:

The editorial in issue No. 47 on "Practical Mathematics," is a most timely one. There can be no doubt whatever as to the character of much of the subject matter of the Geometry of Euclid. It is "bosh" pure and simple.

It has always been a matter of regret to me, that I was compelled to spend so much time as a student in trying to demonstrate truths that are manifestly self-evident. How ridiculous, for instance, it is for one to attempt to prove by analysis that "Parallel lines cannot meet in a point." The mere statement of the conditions prove positively their truth; but yet of such is too much of the book of geometry.

I have forgotten a great deal of my mathematics, far more, in fact, than I feel I can afford to lose. I know of no reason for this, unless it is that as a student too much time was devoted to principles and too little to their application.

To most minds mathematics is dry and uninteresting when studied as a pure science. To make the subject acceptable, it must be presented in such a form as to immediately appeal to the student as of great practical value. This value is proven when applications are made to problems that confront the engineer every day. To my mind, it is far better to know but few principles but to understand how to apply their use, than to know many principles and be ignorant of their application.

The matter appeals to me most strongly from the point of view of the young man employed in the shop days and who spends his evenings at night school. A large part of my own education was obtained in this way, and I know full well how unsatisfactory it is to carry on the work as usually outlined.

I have in mind now some of the courses in our night schools. Many of them, of a high grade, offer geometry as one of the studies. The young student, ignorant of the real value or lack of value of much of the subject matter, elects this study. When he gets to work and finds out how ridiculously stupid much of it is, do you wonder that in so many cases he drops it in disgust? Understand, I do not question the value of the subject as a whole, but I do protest most vigorously against the retention of much of the matter that is contained in the average text-book. If it is necessary to retain all of the present matter in the text-books in order to insure the "symmetrical development of a great subject," surely you will agree with me that where one's time is so limited as in the case of students in our night schools, self-evident truths can be profitably sacrificed, even though at the expense of a symmetrical development of the subject. If the objectionable matter can be cut out with profit to the night-school student, it seems reasonable to believe that it can be likewise treated with profit to the day-school student. A Professor Perry in this country could find an excellent field to work in in our night schools.

DEKE.

## The Avery Engine in a Saw Mill.

Editor American Machinist:

I think I can give you some further information upon the rotary engine or turbine of Mr. Avery, of Syracuse, N. Y., mentioned by Professor Thurston in his paper read before the American Society of Mechanical Engineers at their last meeting. I knew Mr. Avery very well in 1834 and 1835, as he and his family called often at my father's house. I was a boy of 10 and 11 years old, but I remember Mr. Avery having a steam wagon driven by his rotary engine. It was built at a shop called "The Foundry" that was on the south side of the Erie Canal nearly opposite the junction of the Oswego and Erie canals.

When I first saw it, it was started in front of the Syracuse House and was hauled back to the shop. Several days afterward I saw it on the Golden Hill Race Course and it ran a part of the way around the course, but not as fast as I could walk. It was a rough affair, a boiler on three wheels with a round flat case, is about all I remember of it. The mechanism of the engine I knew nothing about at that time.

During the fall and winter of 1847 and 1848 I was at the mouth of the Kalamazoo River, in Michigan, and there was a deserted sawmill with two of Mr. Avery's rotary engines. This mill was the largest sawmill in the State when it was built. It had six Muley saws, the carriages running across the mill that was about 60 feet wide and nearly 200 feet long. The engines were a hollow shaft with two hollow arms at right angles curved backward, the ends having openings of ¾ of an inch. It was the Barker reaction water wheel. The arms revolved in a flat cast-iron case (with Mr. Avery's name and "Syracuse, N. Y.," on one side of them) 6 feet 6 inches in diameter. The arms were 3 feet long. When the mill stopped everything was left except the tools and belts. The grates were under the boilers. Upon the hollow shaft of the

engines was a 12-inch pulley for a 12-inch belt that led to a 5-foot pulley on the line shaft. There were two brass bearings, one on each side of the 5-foot pulley; the other bearings of the shaft were friction rollers of the same kind as were afterward used on grindstones—12-inch pulleys on the line shaft with 3-foot pulleys on the saw shafts. The engines run 5,000 revolutions per minute. The saw cranks were 10 inches, the saws running 333 revolutions per minute, all of the belts having tightening pulleys on them. The engines were supplied with steam from two nests of cylindrical boilers, six in each nest—three above and three below, the fire going under and over the lower three and under the upper three. The boilers were 36 inches diameter and 24 feet long. The steam pipes were connected so that steam could be used from the twelve boilers in either engine. The boilers carried 200 pounds of steam. The mill had been abandoned for several years. But I met two men that had worked in it; one of them was fireman and they told me that the engine would not start the shafting, but the tightener pulleys were lifted and when the engine was at its speed the tighteners were let down and the mill started. It took the twelve boilers to run one side of the mill, three saws, and the three saws could not make 5,000 feet of lumber in twelve hours. Those twelve boilers, with the slide-valve engines of that day (when I saw the mill), would have run twelve Muley saws, 14-inch cranks, 280 strokes per minute with ¾ of an inch feed, and each saw would have made 5,000 feet of lumber every twelve hours. That was the kind of saws that were used at that time in the lumber region of Western Michigan. This was the only sawmill I ever saw or heard of that all the timber, posts, beams, braces and all were planed, and it was all done by hand, costing a rather pretty sum.

JOHN W. SUTTON.

Brooklyn, N. Y.

## Working Hours for Mechanical Engineering Draftsmen.

Editor American Machinist:

The writer is of the opinion that some regular and standard number of hours per week is most desirable for draftsmen. In the city in which I am employed there are in the five works about 200 draftsmen, some of whom work sixty hours, others fifty-three and the remainder forty-nine hours per week. This variation of hours should be abolished; and after twenty years' experience in the drafting room, I have come to the conclusion that forty-four hours per week is enough—say eight hours a day for five days and four hours for Saturday. I have been favored with one week's vacation with pay once in ten years; and am of the opinion, also, that two weeks every year, with pay, is the correct thing, and in this manner: One day a month for six months in the year, when we may be enabled to visit some other industry, with advantage to our employers and ourselves; the remaining six days for rest and recuperation. I should be glad if some of your drafting readers would give their views as to how this standardizing system can be inaugurated. Shop workers' hours are pretty generally the same up to within the past few months, when I note they are asking for a nine-hour day, and doubtless they will obtain this boon ere long.

PROGRESS & FORWARD.

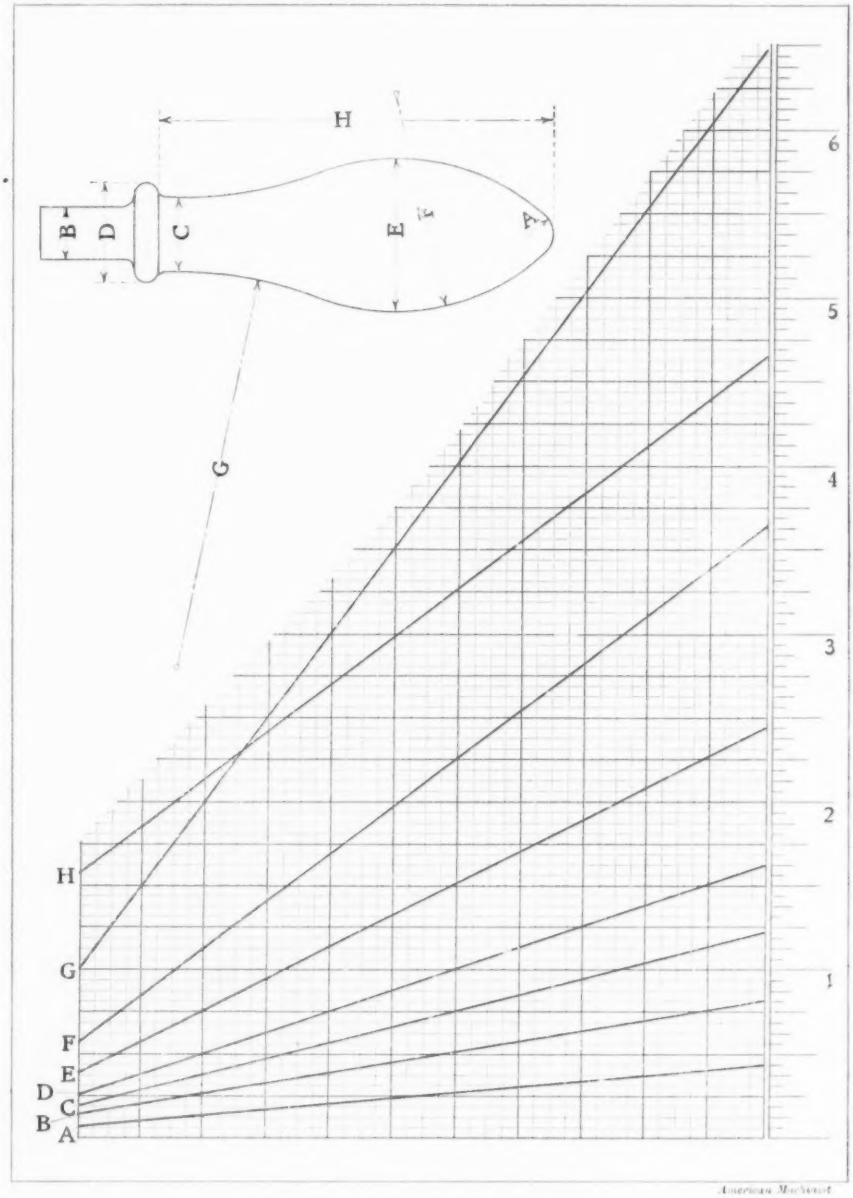



CHART FOR MACHINE-TOOL HANDLES.

## Machine-Tool Handles Charted.

Editor American Machinist:

I was much interested in the article contributed by Mr. Dreses, published in your issue No. 9, last year, relating to handles, ball cranks and hand wheels.

I have worked out the formulas given for handles, as given in the article, and arranged the results in graphical form, which I think would be more convenient for drafting-room work. Enclosed please find blueprint showing result.

You will notice two holes punched near the top of the sheet. This is so that it may be inserted in what is known as a "college binder," which consists of covers and a device for holding paper of the size shown by means of small staples. I find this very convenient for preserving data of this kind. They are manufactured by A. D. Machachlan, 214 Clarendon street, Boston, Mass., and the binder, containing fifty sheets of paper, ruled on one side and plain on the other, costs only 20 cents.

A. B. B.

## Some Notable Engines.

The Westinghouse Machine Company, of Pittsburgh, has recently completed for the Kings County Electric Light and Power Company, of Brooklyn, two en-

gines of the vertical cross-compound condensing type, especially designed for driving alternating current generators mounted directly on the shaft of the engine. The engines have a nominal capacity of 4,000 horse-power and are expected to be able to carry successfully overloads of 7,500 horse-power. The principal dimensions of the engines are as follows:

Hight from floor line to top of cylinders, about 35 feet; length along the shaft, 38 feet 6 inches; width, 28 feet; diameter of high-pressure cylinder, 46 inches; diameter of low-pressure cylinder, 86 inches; stroke, 60 inches; number of revolutions per minute, 75; steam pressure, 170 pounds. The diameter of the shaft in the center is 39 inches; diameter of shaft at bearings, 34 inches; length of each bearing, 60 inches; total weight of the shaft without crank-cheeks or flywheel centers, about 75,000 pounds. The shaft is of hydraulic-forged, oil-hardened steel, having a hole through its entire length 16 inches in diameter. The flywheel is very massive, having 100 tons in the rim. The diameter of the wheel is 28 feet; velocity of rim, 6,600 feet, or practically 1¼ miles per minute. The bearing shells and caps are water-jacketed, as are also the crosshead slides. The generators of the Westinghouse engine type have an output of 2,850 kilowatts each, giving a three-phase current of 250 amperes in each phase at 6,600 volts, with 3,000 alternations per minute. They have separately excited fields and operate in multiple with other Westinghouse units.

Building engines of such great size calls for unusual shop and foundry facilities and even their shipment is by no means an insignificant problem. Thus, for instance, the two bed-plates of one of these engines weigh over 43 tons each, and as they are cast in one piece they are very difficult to handle. For transporting these castings to Brooklyn, the Pennsylvania Railroad has constructed special steel cars. The flywheel is built up in segments, and each of these segments is a carload.

## Death of Charles Sells, Veteran Marine Engine Designer.

The issue of "Engineering," London, for December 21 contains a portrait and biographical sketch of Charles Sells, who died December 1, eighty years old. Mr. Sells, who was born in London, went as a pupil to the firm of Mandslay, Sons & Field in his seventeenth year, and was in the employ of that firm nearly sixty years, only retiring in 1805 on account of failing sight. It appears that when Sells first engaged with the firm, in 1837, the then already large engineering business was carried on without a drawing office, the operations of the shops being largely performed under the personal supervision of the partners, who made sketch drawings as they went along. In 1847 a designing department was constituted, and Sells was placed in charge. The minute adopted by the Board of Directors of the company upon Mr. Sells' retirement said that "perhaps no man in England has designed more steam machinery than Mr. Sells, commencing from almost the earliest days of the marine engine to the present time, with the extraordinary result that such designs have proved a series of brilliant successes. The fact, in their opinion, places Mr. Sells in the position of being the most successful designer of the marine steam engine of the present century." Although the firm of Mandslay is now best known in marine engineering, in the earlier days their field was broader. Sells had to design coining presses and other machinery for the Royal Mint and for other nations, stationary engines of various styles, pumping engines for water-works and for drainage, air exhausters of an atmospheric railway, dredges, sugar machinery and various other machines. He designed a steam carriage for common roads, he had much to do with the more general use of the indicator, and the firm made the first that were supplied to the Admiralty. The firm also made their own machine tools and supplied them to other firms. Whitworth first learned the practical applications of accurate measurements at Mandslay's, where he was a pupil and contemporary with Sells. Nasmyth and Alexander Kirk were also contemporaries of Sells at Mandslay's. Sells had much to do experimentally with the development of the screw propeller. He took out a number of patents, among which the most notable were a three-cylinder engine, a reversing gear and the horizontal engine with return connecting rod. He designed many of the foremost ships of their day in the British Navy, also such transatlantic liners as the "Oceanic," "Britannic" and "Germanic." The sketch in "Engineering" concludes as follows:

"Thus from the dawn of steam navigation down to the present day, Charles Sells has stood in the front rank as a marine engineer of the highest class. He was little known outside his own circle, and it may be thought by those who never heard his name that this is a long notice for one so little in the public eye. That, however, only brings out one of the characteristics of the man—the absence of self-advertisement or self-seeking of any kind. In that respect he was behind the age. He was a tremendous worker, having a power of long-sustained concentrated effort, without which he could not have completed his life's task in spite of his many years. As we have said, he was an engineer of the old school—not in any way a 'Captain of Industry' or organizer of vast aggregations of capital. He loved his work for the work's sake. To make something sound, honest and good; to advance beyond what had been done; to bring in a new principle or a fresh combination towards a higher result; to increase the reputation of the firm he had served since his boyhood—brought to him the pleasure in which he delighted and the reward he sought."

## How Russia Built up Her Home Industries.

Under the title "Russia's Industrial Independence" a writer in the "Berliner Tageblatt" gives the cause of the deplorable business conditon of that country.

Since it is an ambition of most nations to supply their own needs, no wonder so big and powerful a country as Russia was smitten by this idea and by legislation tried to put herself in a position where she could get along without the help of her neighbors. In the past century laws have been enacted after the nature of protective measures generally, levying high duties, interposing all sorts of hindrances to foreign imports and in some cases prohibiting them altogether. The results have been quite other than what was hoped for.

The greatest damage from this policy has been sustained by agriculture, which is the principal source of income in Russia. In order to cultivate the ground successfully machinery and implements of good construction are necessary, especially where hand labor is comparatively scarce, as it is in many parts of Russia. The best agricultural machinery came from America, England and Germany, but the tariff upon it was made so high as to be prohibitive to the ordinary farmer. Moreover, the forms of iron and steel used in agricultural implements were subjected to such heavy duties as to handicap the domestic manufacture of such utensils. As a consequence the Russians got along as best they might with the crude apparatus they could make cheaply. An ordinary farm wagon which as built in Germany has iron axles, boxes and, all told, several hundred-weight of iron and steel about it, is built in Russia without a pound of iron. The small farmer has to use a vehicle with wooden boxes and no tires, which has little efficiency for service and is constantly in need of repair. It is the same way with the tools of the mechanic. He works with implements of antediluvian forms which he makes himself.

The result of the stupid economy thus fostered by law is, that every year the harvests in large districts turn out to be grossly inadequate and famine prevails through great portions of the empire. At last the government is recognizing its mistakes and is trying to amend them somewhat. For instance, it has made the importation of mining machinery into Siberia and the Ural free for ten years. But these improvements are relatively small.

The blighting effects of the old policy have extended to all industries, and as a result almost all im-

portant undertakings are in the hands of foreigners. The district of Yekaterinoslaff, for instance, containing deposits of coal and iron ore, is almost exclusively Belgian, so that it has become known as "Little Belgium." The great petroleum industry is controlled by Englishmen. Native enterprise has been put to sleep; such is the result of "industrial independence." Only free trade, says the writer, could do any good, and that is not to be thought of. As to the present famine, it is remarked that Minister of Finance Witte is attempting to relieve the high prices in the Amur district by means of an imperial decree which has given foreign vessels the right to carry freight from European Russian to East Asian Russian ports.

Russia is a country from which 50,000,000 farmers sell their products abroad and must take foreign goods in exchange. This natural reciprocity the government with best intentions destroys through its tariffs.

The view of rural Russian industrial conditions presented by the author of the foregoing suggests a certain picture of Count Tolstoi plowing with a plow consisting chiefly, as we remember it, of a sharp stick of wood set at angles to a beam, in using which he is intentionally subjecting himself to the prevalent conditions of labor in that country. The reforms attempted of late years in the way of removing duties from agricultural implements seem to have been overlooked by the writer, which may be because he regards them as trivial. The whole subject is a forcible object lesson for nations and individuals. To stint agriculture in order to promote wagon building and to discourage wagon building until a far-off ideal is achieved in making wagon hardware, is the oft-repeated mistake of neglecting something which one can, or could, do well in order to do something which one is not fitted to accomplish. It is the mistake also of trying to do too many things at once.

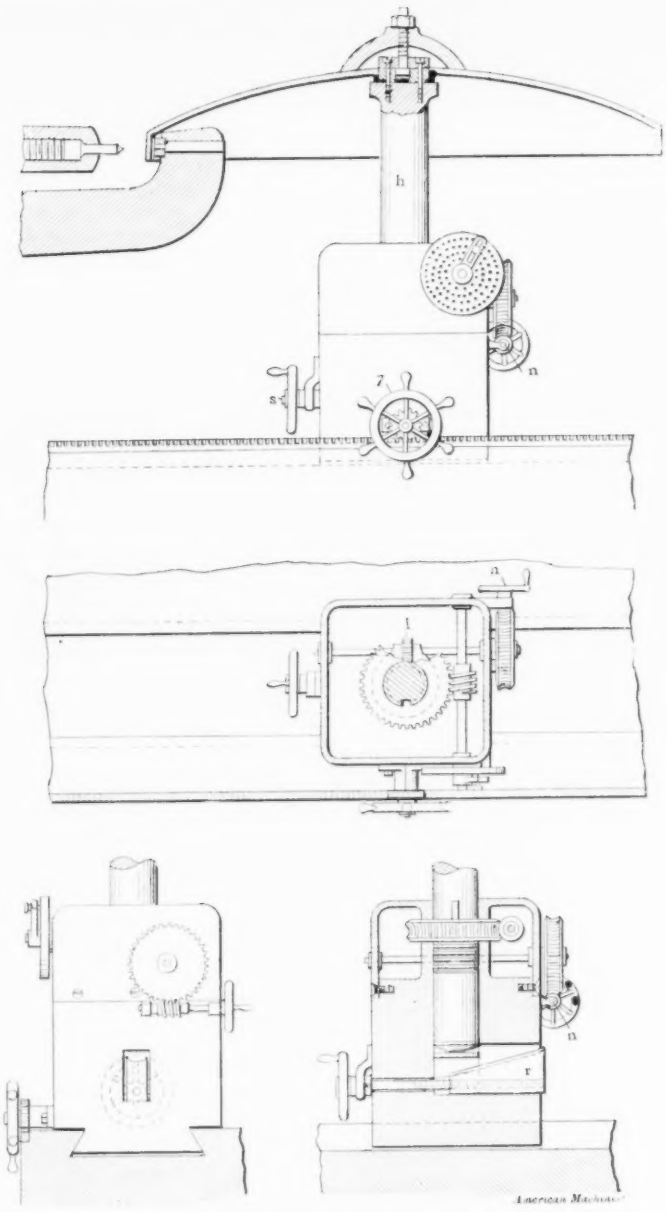
## Examination for Draftsmen.

The United States Civil Service Commission, Washington, D. C., will hold examinations, February 5, in any city where there is postal free delivery, for draftsmen in the Geological Survey, to be given employment at intervals in periods of one to four months. Address the commission for application forms 304 and 375.

## Some New Things.

A DIVIDING HEAD FOR A PUNCH.

The cut shows an arrangement for application to a horizontal punch whereby boiler heads and similar flanged articles may be accurately spaced and punched without the labor of previously laying out the work. The piece to be punched is assumed to have a central opening, and by




A DIVIDING HEAD FOR A PUNCH.

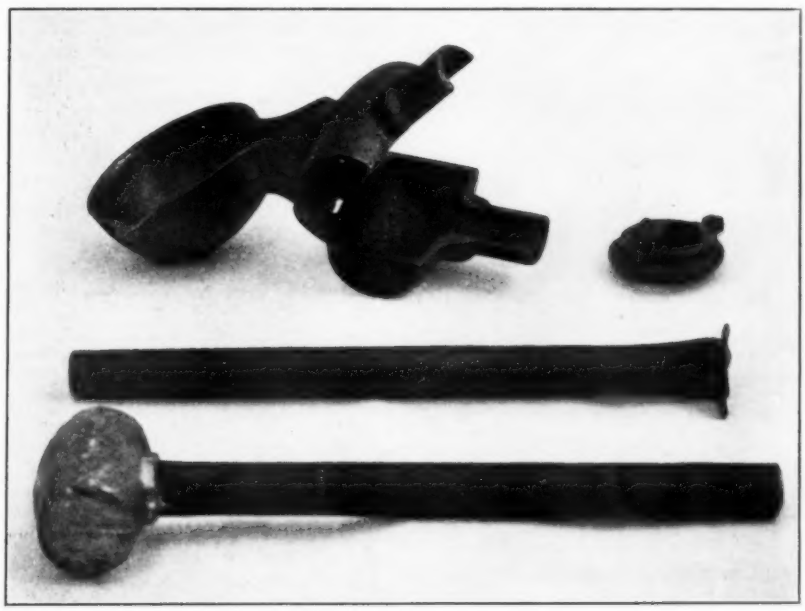
means of a stud or bolt extending up through this, and a crowfoot above, the work is securely fastened to the stiff vertical shaft *h*. The stand or carriage for this vertical shaft is movable along a horizontal slide by means of a rack and pinion operated by the front hand-wheel 7. The axis of the vertical shaft is thus always in line with the axis of the punch. This shaft has upon it a series of grooves which constitute a continuous rack for raising and lowering the shaft. In this circular rack meshes pinion *l*, which is operated, through worm-wheel and worm, by hand-wheel *n*. When the hight of the shaft and the work is thus correctly adjusted, the step under the end of the shaft is set to support the weight by the screw-operated wedge-block *r* and hand-wheel *s*. The graduated dial with worm and worm-wheel provide for the correct rotation of the work according to the number of holes to be punched. This worm-wheel is splined to permit of the raising and lowering of the shaft as previously spoken of.

The arrangement here shown is of course equally applicable to vertical punches for dividing and punching flat circular disks, strainers, etc. It may also be applied to drills, either horizontal or vertical. The inventor is P. J. Kelly, Elizabeth, N. J.

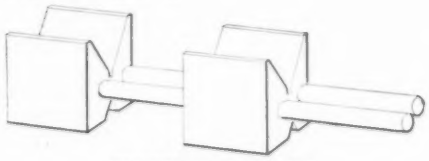
MOLD AND LADLE FOR SOFT METAL TOOLS.

The half-tone shows what may be termed a missionary device. Its mission is the preservation of finished work by the promotion of the use of soft hammers. The soft hammers, it is argued, will be more generally used in machine shops and engine rooms, and in other places where it is necessary to drive or otherwise apply force to carefully-shaped and finished surfaces, if the hammers are easily and cheaply producible and renewable, and the device here shown seems to fully guarantee these particulars. Here

are shown a recently cast hammer, a piece of pipe for the handle of another hammer—the end of the pipe upon which the hammer head is to be cast having been flatted and spread out to secure a good hold for the metal—and a mold in which the hammer head is to be cast. The pipe is inserted and the mold is closed and fastened by the clamp shown at the side, when all is ready for the pouring. The device does not stop here, but provides the ladle for the metal as an integral part of the mold itself. When the metal is melted and ready for the pouring, it is only necessary to tip up the ladle, when the metal runs into and fills the mold, and there you are. It is simple, neat and complete. The ladle may of course also be used as a dipper when a larger pot of metal is in use, and a number of hammers can then be cast in rapid succession. The size of the ladle is of course adapted to the capacity of the mold to which it is attached. Molds are made for hammers of different sizes and shapes as required. They are also made for vise-jaws, another very necessary application of soft metal in handling or working upon finished work. Different alloys of metal, for different degrees of hardness, will be used for different lines of work. These molds are made by Charles H. Field, 234 Chestnut street, Providence, R. I.



COMBINED MOLD AND LADLE FOR SOFT-METAL TOOLS.

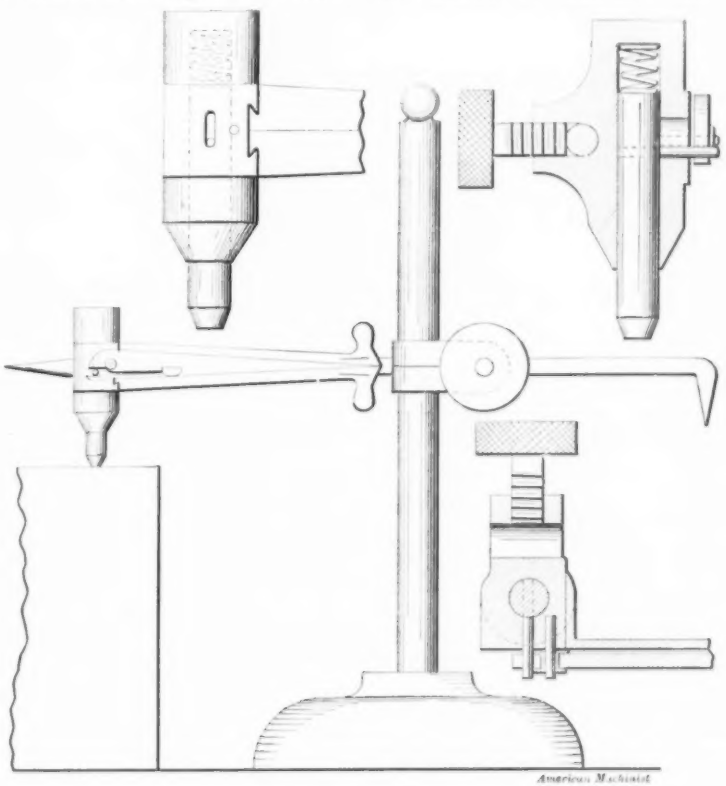


CONNECTED V-BLOCKS.

Most of our readers are familiar with V-blocks and their uses, and we illustrate herewith a new arrangement of such blocks, which involves inserting two rods in one of the blocks so that they are fixed, while the other V-block slides upon them. They can thus be placed at any distance apart that may be required by the work, and are then held together in a way that makes their use more convenient than is ordinarily the case. These blocks are hardened, are 1¼ inches high and 1⅜ inches wide and are made by the Ideal Machine Works, Hartford, Conn.

A TRUING GAGE.

The cut shows a little device recently patented which, according to the record, it took three men to invent. One man will be able to understand it without much explanation. It is shown full size, mounted on the pointer of a surface gage, and its use is to indicate minute variations in the hight of the surface to which it is applied, which it does by the movements of the horizontal lever on the face of it. The body of the instrument has a projection on the side, with a hole which may be slipped over the pointer of a surface gage, as shown, over a rod of proper size held in the tool-post of a lathe, or elsewhere, and clamped by the milled head screw. There is a spring-actuated plunger, the longitudinal movement of which is limited by a little slot on the side and a pin projecting through it. The pin projects outside of the body of the instrument far enough to engage the short end of the indicating lever. A spring on this lever holds it in contact with the pin. The lever and the arm which carries the arc are easily removable. The indications of the instrument may be made as minute as may be desired by a suitable ratio for the lever arms.

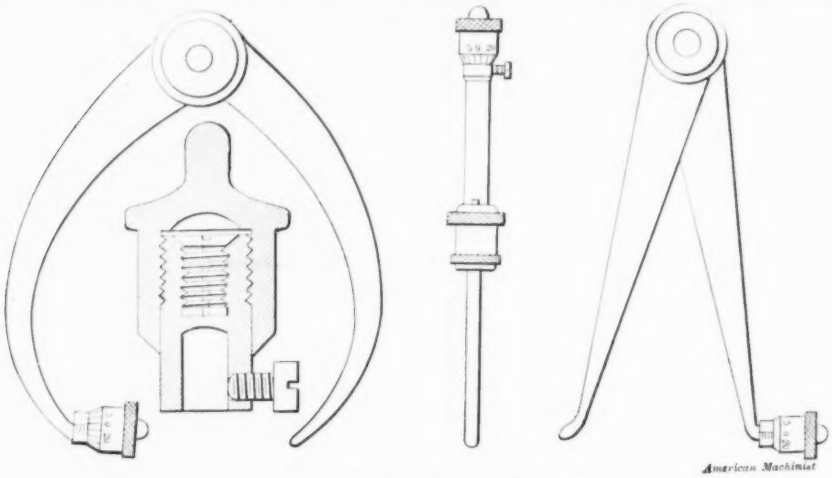


A TRUING GAGE.

A MICROMETER ATTACHMENT FOR TOOLS.

The cut shows some of the applications of a little micrometer attachment for the familiar tools of the machinist—calipers, inside or outside, or telescopic as shown, or elsewhere—being readily changeable from one tool to another. It is considerably smaller than here shown in section, being only 7-16 inch diameter and 13-16 inch long. It reads to thousandths of an inch in the usual way, with a travel of 3-16 inch, and it may be used on inside calipers for diameters as small as 1 inch. There

is an inner piece, with a round-head screw for securing it where required and the cap with the central measuring nose. The inner piece is split with two cross notches to a considerable depth, and the central conical head screw is for expanding it and maintaining a snug fit in the cap. The attachment is made by T. R. James, 10,620 Hoxie avenue, Chicago.




A MICROMETER TOOL ATTACHMENT.

## Highest Chimney.

What is said to be the highest chimney in the world is a new one at Antwerp, Belgium. The Silver Works Company there has just completed the construction of a shaft 125 meters (410 feet) high. The interior diameter at the base is about 25 feet, and at the top 11 feet, and the chimney is surmounted by a lightning conductor nearly 50 feet high.

## Personal.

O. C. Burdict, who is known as an expert in bolt-making machinery, is now associated with the Howard Iron Works, of Buffalo, N. Y.

W. R. Warner addressed the Civil Engineers' Club, of Cleveland, Ohio, at a special Christmas gathering, December 28, on the Paris Exposition.

Geo. E. Howard, who was formerly with the Standard Plate Glass Company, of Butler, Pa., has become engineer in charge of construction for the Saginaw Plate Glass Company, of Saginaw, Mich.

Colonel H. G. Prout, editor of the "Railroad Gazette," delivered on December 20 an address before the engineering students of Purdue University on the subject of "The Future of the Engineer in Railway Service."

The iron and steel firm, Otis, Hough & Co., Cleveland, Ohio, sales agents for Jones & Laughlin's, Ltd., have admitted to partnership Wm. F. Bonnell and F. Alton Pope, and have changed their firm name to Otis, Bonnell & Co.

J. R. Matlack, of New York, member of A. S. M. E., has been appointed superintendent of the Harrisburg (Pa.) Foundry and Machine Works, succeeding B. T. Allen, who has been promoted to the position of mechanical engineer of the plant.

## Inquiry for Machinery.

(138) Wanted, names and addresses of manufacturers of machines for turning wood heels for shoes.

Some of the recent consular reports must have a very harrowing effect on the feelings of one of our esteemed contemporaries which had decided that the use of cannons to prevent hailstorms in the grape-growing regions of France and other parts of Europe was absurd and could not have any such effect. The people who have tried this, however, insist that it does prevent the storms and it is said in a recent report that in a region which had been most regularly devastated by hailstorms every summer for many years the cannons were tried recently for the first time with the result that not one destructive storm came to that region, whereas a few miles away, where the cannons were not used, the usual storms prevailed with the usual destructive effects. This looks as though there were something in it, and those who own the ground on which grapes are raised will probably find it a good thing for them whether the real grape growers do or not.

A new mechanical building has been commenced at Syracuse University, Syracuse, N. Y. It is the gift of Lyman C. Smith and will cost $60,000. In the basement there will be an engine-testing room, rooms for two small testing machines, dynamo rooms, etc. The first floor will contain a carpenter and machine shop, each 57x53 feet.

We of course must have a word for the building where we keep our automobile. A writer in "The Horseless Age" suggests "autogorium," which should be a good word to start from, as it is doubtful if anyone can do worse.

An inventor in Ohio has patented a somewhat interesting arrangement for operating turntables for trolley cars. The car is run upon the turntable by its own power, and when it is in position its front wheels rest upon wheels or rollers projecting slightly up through the track, then by gently starting the car motor the front wheels and the rollers supporting them are made to revolve and a suitable train of gearing with a circular rack gives the required movement to the turntable. It is easy to see how this can be made to work, but after all it is not as simple as would be a small motor geared directly to the turntable, and the question arises as to why a turntable should be required at all for a trolley car.

# New Catalogs.

**The Garvin Machine Company has sent us a pamphlet describing its No. 21 automatic lever collet chuck monitor and No. 22 automatic lever box chuck monitor lathes. Size, standard, 6x9 inches.**

**The Duryea Power Company, Reading, Pa., manufacturer of automobiles, motors and launches has sent us a catalog relating to a hydrocarbon driving phaeton, traps, launches, etc. Size, 6¾x5¼ inches.**

**The Automatic Machine Company, Greenfield, Mass., has sent us a 1900-1901 catalog of small automatic screw machines, speed lathes and cutter grinders. The pamphlet presents a very neat and attractive appearance. Size of page, 6x9 inches.**

**The Grant Gear Works, 6 Portland street, Boston, Mass., have sent us their 1901 catalog. It lists a line of gears of many sorts, racks, ratchets, brass worm gears, a great variety of sprocket chains, etc. Some brief directions for drawing gears are contained. Size, 5x7 inches.**

*(Continued on page 51.)*

# Miscellaneous Wants.

*Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.*

Gear Wheels, gear cutting. Grant ; see p. 24.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Light and fine mach'y to order ; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Parallel drawing-board attachments ; by mail, $1.50 ; circulars. F. G. Hobart, Beloit,Wis.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Send for circular of the Rich Handy Drawing Outfit ; it is a great time-saver. J. & G. Rich, 120 N. 6th st., Philadelphia, Pa.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, cut light gears, cams, and duplicate small machine parts, in quantities.

Attention!—Send $1 and receive package compound to temper cast iron same as steel ; highly endorsed. Address F. D. Hamlin, Osceola Mills, Clearfield Co., Pa.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

A well-equipped machine shop and foundry, with ample water power, capacity 50 mechanics, tools suitable for engine building up to 24x24-inch or similar work, invites proposals in their line, or will consider manu-

facturing new specialties. Address P. O. Drawer, 414, Lockport, N. Y.

The annual meeting of the stockholders of the American Machinist Press, for the election of five directors for the ensuing year and for the transaction of such other business as may properly come before the meeting, will be held at the office of the company, 218 William st., in the City of New York, Borough of Manhattan, on the 14th day of January, 1901, at 12 o'clock noon.

A. LEIGHTON DONNELL, Secretary.

# Wants.

*Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.*

## Situations Wanted.

First-class patternmaker desires position in New England. Box 200, AMER. MACHINIST.

Experienced mechanical draftsman, graduate, wants position. Box 198, AMER. MACH.

Capable and experienced machine draftsman wants permanent position. G., care A. M.

Young man with 3 years' experience in machine shop wants position. Box 194, AM. M.

Foreman machinist, 30 years' experience on wire-working machines, wants change. Box 180, AMERICAN MACHINIST.

Mechanical draftsman, speaks German only, educated in Germany, seeks position. Box 181, AMERICAN MACHINIST.

Experienced draftsman desires permanent position in or near New York city; age 24; graduate. Box 206, AMERICAN MACHINIST.

Experienced designer of light machinery, tools and electrical apparatus wants employment. Address Box 204, AMER. MACHINIST.

Automobile steam engines; toolmaker, well up in designing and building, wishes situation; interchangeability, etc. Box 201, A. M.

Wanted—By foundry foreman, foremanship of foundry making engine castings or general jobbing, heavy or light. Address Box 178, AMERICAN MACHINIST.

Wanted—Situation as foreman of machine shop making a class of work on which large proportion of apprentices can be employed. Address Box 197, AMERICAN MACHINIST.

Foreman machinist wishes to change; 12 years in charge of men; up to date in modern methods, machine tools, special machines, engines and general work. Box 205, AM. MACH.

Chemist of experience in steel, iron and blast-furnace materials wishes position with reliable firm; college graduate; good references; now employed. "National," AM. MACH.

Wanted—A position in charge of manufacturing plant where rapid and duplicate work is required; have been successful in increasing the output and reducing the cost of production; satisfactory references. Address Box 193, AMERICAN MACHINIST.

Wanted—Position as superintendent; capable of organizing and handling a machinery plant in all its branches; am a designer of special and automatic machinery, tools, jigs, fixtures for the rapid and economical production of interchangeable work. W. H. S., AMERICAN MACHINIST.

Position wanted as factory manager; a practical mechanic and thoroughly familiar with modern and most efficient methods of management in foundries, machine shops and allied departments; extensive experience as an expert in the management of help and general manufacturing. Box 188, AM. MACH.

## Help Wanted.

Wanted—Mechanical draftsman. Address American Steel & Wire Company, Shoenberger Works, Pittsburgh, Pa.

Wanted—Machinists; two all-round men needed to work on machines. Address Republic Glass Co., Clarksburg, W. Va.

Superintendent wanted for gas-engine works employing 150 men; give full particulars as to experience, age, etc. Box 157, AMER. MACH.

Wanted—Experienced draftsman and designer for general engine and machine work; state salary, age and reference. Robt. Wetherill & Co., Chester, Pa.

Wanted—Draftsman for general work; graduate of technical school preferred; chance for young man to develop; locality, Worcester County. Address Box 203, AMER. MACH.

Draftsman wanted; an experienced and systematic machine draftsman and designer; state age, experience, nationality, salary and references. Address Box 195, AMER. MACH.

Wanted—Foreman in iron valves and fittings; none but experienced men need apply; state age, married or single, and wages expected. Address Box 185, AMER. MACHINIST.

Wanted—A superintendent of machine shops in Western city near Chicago; must have good references. Address, giving class of work heretofore engaged in, Box 191, A. M.

Wanted—Competent and experienced traveling salesman on machine tools; one who is acquainted with modern shop practice preferred. Address Box 196, AMER. MACHINIST.

Wanted—Several experienced machinists and toolmakers on a medium grade of drill jig and tool work; good wages to progressive, live men. Address "Baltimore, Md.," care AMERICAN MACHINIST.

Wanted—By new concern, an up-to-date mechanic as foreman; must be good toolmaker and experienced in gear cutting; good opportunity for advancement. Address Fawcus Machine Co., Pittsburgh, Pa.

Wanted—Machine tool salesman for cities of New York, Pittsburgh and Cleveland; local resident, acquainted with the trade, preferred; write, stating experience and giving references. Address Box 202, AMER. MACHINIST.

Wanted—Ten first-class toolmakers; must have experience on drill jigs, milling fixtures, gages and tools for interchangeable parts; all close work. Apply at once, National Cash Register Company, Employment Department, Dayton, Ohio.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

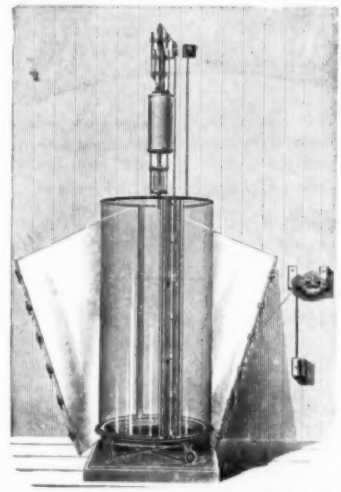
Wanted—Salesman for New York city and vicinity who understands how to sell pneumatic tools; must have had experience and know how to operate and explain their use; salary, commission, or both; give references. Address Box 199, AMERICAN MACHINIST.

(*Continued on page 52.*)

**Here's the Right Grinder**

for every shop having use for a Universal and a Cutter Grinder, but not enough use to warrant the purchase of the two machines. Here are both in one—a Universal and Cutter Grinder cleverly combined. Better get our catalog and investigate.

**A. FALKENAU, 109-115 North 22d Street,**
**PHILADELPHIA, PA.**
Thos. A. Kenshaw, 75 A Queen Victoria St., London, England.



A new and better scheme for Blueprinting by Electric Light. Write for details—they're interesting.

**THE PITTSBURG BLUE PRINT CO., Inc.**
**1505 Park Bldg., PITTSBURG, PA.**

(*Continued from page 52.*)

We have received a copy of the Register of Cornell University for 1900-1901. It has 493 pages and contains information about all the departments, including Sibley College. In the front is a folding map showing location of the numerous buildings of the university. Size, 5½x8 inches.

We have received a catalog showing a line of motor-driven duplex air compressors made by the Westinghouse Air-Brake Company, Pittsburgh, Pa. These are adapted to air-brake work on electric cars and other purposes and are compactly built. Size of catalog, standard, 9x6 inches.

The Charter Gas & Gasoline Engine Company, 9-11 Wallace street, Sterling, Ill., sends us a catalog of its engines, which are built both horizontal and vertical and in various combinations. Pumping outfits, hoists and portable and semi-traction arrangements are illustrated. Size, 5¾x9 inches.

The Philadelphia Pneumatic Tool Company, Stephen Girard Building, Philadelphia, Pa., has sent us a number of catalog sheets, etc., showing its hammers for chipping and calking and riveting, pneumatic rotary drills, the Keller pneumatic rammer and a line of reamers. Size, mostly, 7x10½ inches.

The Jeffrey Manufacturing Company, Columbus, O., manufacturer of chain belting and steel cable, elevating and conveying machinery, has ready for distribution to interested parties its 96-page catalog and price list, No. 57, covering the sawmill, lumber and woodworking industries. It is 5¼x7¾ inches.

The New Era Iron Works Company, Dayton, O., has sent us a copy of a catalog of gas and gasoline engines, which run from 5 to 125 horse-power in size. The company has recently bought and equipped a new plant, a view of which is given. The catalog is illustrated with a number of full-page half-tones. Size, 9x6¾ inches.

"Some Facts About Modern Presses" is a little pamphlet published by the Babcock Printing Press Manufacturing Company, New London, Conn., to explain their "Optimus" ball and socket joint, which is said to give a regular motion to the bed while printing, and which they compare with the Napier joint. Size, 3½x5 inches.

The Becker Brainerd Milling Machine Company, Hyde Park, Mass., has sent us its new catalog, No. 51, relating to horizontal milling machines and attachments, automatic gear cutters, milling cutters, cutter grinders, etc. An independent catalog of vertical milling machines is in preparation. The one received is 4x6¼ inches.

We have received from the James Reilly Repair & Supply Company, 229-230 West street, New York, a catalog of evaporating and distilling apparatus for furnishing boiler feed and drinking water on ship board, and for use on shore; also evaporators for sugar manufacture, etc.; coil condensers, coil feed water heaters, filters, etc. It is 6x9 inches, standard size.

The Union Steam Pump Company, Battle Creek, Mich., sends us a catalog of the Moore and the Burnham pumps made by them. Some of the types of machines shown are a combined boiler and pump, vacuum pumps, hydraulic pressure pumps, an independent air pump and jet condenser, deep-well pumping engines and air compressors. Size 7x7¼ inches.

Fay & Scott, Dexter, Me., have sent a catalog of machine tools and patternmakers' lathes. Among them are a line of engine lathes of 32-inch swing and under, a turret machine, universal turret lathe, automatic spindle drilling lathe, 12-inch shaping machine, double-ended drill lathe and some new

carriage turrets. Among the patternmakers' tools is an 84-inch swing face-plate lathe. The catalog is 6x9⅝ inches.

The General Electric Company, Schenectady, N. Y., has sent us a pamphlet containing an illustrated article on the "Aging of Transformer Iron," by W. Elwell Goldsborough; one on "Slow Changes in the Magnetic Permeability of Iron," by William M. Mordey; on "Hysteresis in Sheet Iron and Steel," by Arthur Hillyer Ford; on "Effects of Prolonged Heating on the Magnetic Properties of Iron," by S. R. Roget, B. A., and on the "Aging of Transformer Steel," by J. A. Capp. It is 5¼x7¾ inches.

The Perkins Machine Company, Boston, Mass., has sent us a catalog of power presses, shapers, drop hammers and special machinery. Among the machines listed are punching, reducing, forming, hand-lever, power and hand screw, foot-power, drawing, stamping and other presses, combined punches and shears, hand-power and circular shears, drop hammers for hand, power and compressed air; double-seaming machines, beading and flanging, crimping, forming, slitting and wire-straightening machines; dies of all descriptions and crank, friction and snagging shapers. Size, 6¼x9¼ inches.

## Manufacturers.

The Louisville (Ky.) Bolt & Iron Company will erect a bar mill.

Surveys have been commenced for waterworks at Woodstock, Va.

It is understood that A. C. Chandler, Westfield, Me., will build a new lumber mill.

A tract of 62.9 acres has been purchased for the South Buffalo (N. Y.) Steel Plant.

The Iron Bedstead Company at High Point, N. C., has nearly completed a large factory.

J. B. Jeter, of Caroline, Va., will build an excelsior factory at Doswell, Hanover County, Va.

A factory is being built for the Ohio Button Company on North Main street, Venice, Ill.

The Lewis Roofing Company, Moline, Ill., lost its plant by fire December 18, but will rebuild.

The Grand Trunk Railroad is considering the erection next year of a new elevator at Portland, Me.

The Graber Novelty Company, of Newark, N. J., has secured land at Dewey Park, where it will erect a factory.

A hosiery factory will be built for G. Schmidt & Bro. on Lafayette and Baker streets, Philadelphia, Pa.

The American Kaolin Company is laying the foundation for a plant at Yallaha, Fla., which will cost $100,000.

James A. Kirkpatrick and others are to start at Niles, O., a factory to make curtain poles and other novelties.

The Capital Furniture Company, Little Rock, Ark., has bought land on which to build a furniture factory.

The War Eagle Mining Company will rebuild its zinc mill on North Heights, near Joplin, Mo., which was burned.

It is reported that the Toledo (O.) Spring & Mattress Company, on Monroe street, will have a new plant in the spring.

The Wichita (Kan.) Mining Company will probably rebuild at once a mill at its mine which was burned a few days ago.

The Concord Manufacturing Company, woolens, will build an addition to its mill at Penacook, N. H., in the near future.

(*Continued on page 53.*)

## Help Wanted—Continued.

Wanted—General manager of machine shops, foundry, etc., employing 800 men; a good opening for a man of experience with ability in both mechanical and executive departments. Address, with references and advise past experience, Box 192, AMER. MACH.

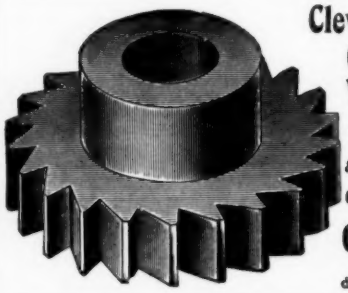
Wanted—First-class machinists, vise hands, floor hands, machine hands; have lately increased our plant and can offer good men steady jobs and good pay; good, healthy town and cheap living. Write fully, American Mach. & Foundry Co., Hanover, York Co., Pa.

Wanted—First-class, all-round boilermaker, to take position of assistant foreman modern boiler shop employing 200 men; must be able to personally manage the erecting floor. Address, giving age, experience and compensation desired, Struthers, Wells & Co., Warren, Pa.

Wanted—Mechanical engineers; we are continually increasing our output of elevating, conveying, crushing and screening machinery, and wish to correspond with competent engineers trained in this class of work who are open for engagements. Address the Aultman Company, Canton, O.

Wanted—One or two first-class mechanical draftsmen and also a few men with electrical and mechanical experience on switchboard drafting, for General Electric Co., Schenectady works. Call Friday afternoon, January 11, between 2 P. M. and 4. P. M, Mansfield, 44 Broad st., New York City.

Wanted—Foreman for tinware factory, who can set dies and take charge of large drawing presses, spinning lathes, double seamers, etc.; only those who are experienced in the manufacture of stamped and pieced ware need apply; references required; steady work. Address "Stamper," AMERICAN MACHINIST.

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**Bench Screw Slotter**
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Low in price.
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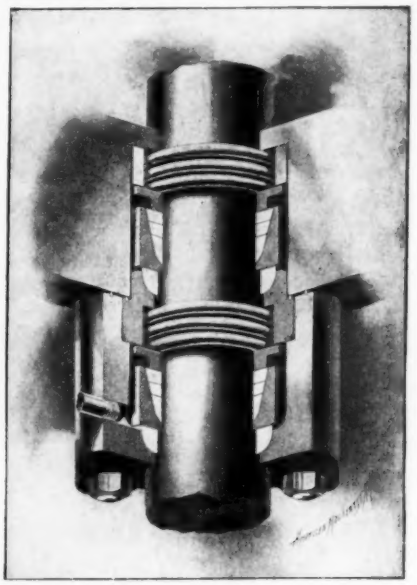
**R.D.NUTTALL CO.**
**PITTSBURG, PA.**



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